This is a digital copy of a book that was preserved for generations on library shelves before it was carefully scanned by Google as part of a project to make the world's books discoverable online.

It has survived long enough for the copyright to expire and the book to enter the public domain. A public domain book is one that was never subject to copyright or whose legal copyright term has expired. Whether a book is in the public domain may vary country to country. Public domain books are our gateways to the past, representing a wealth of history, culture and knowledge that's often difficult to discover.

Marks, notations and other marginalia present in the original volume will appear in this file - a reminder of this book's long journey from the publisher to a library and finally to you.

**Usage guidelines**

Google is proud to partner with libraries to digitize public domain materials and make them widely accessible. Public domain books belong to the public and we are merely their custodians. Nevertheless, this work is expensive, so in order to keep providing this resource, we have taken steps to prevent abuse by commercial parties, including placing technical restrictions on automated querying.

We also ask that you:

+ *Make non-commercial use of the files* We designed Google Book Search for use by individuals, and we request that you use these files for personal, non-commercial purposes.

+ *Refrain from automated querying* Do not send automated queries of any sort to Google's system: If you are conducting research on machine translation, optical character recognition or other areas where access to a large amount of text is helpful, please contact us. We encourage the use of public domain materials for these purposes and may be able to help.

+ *Maintain attribution* The Google "watermark" you see on each file is essential for informing people about this project and helping them find additional materials through Google Book Search. Please do not remove it.

+ *Keep it legal* Whatever your use, remember that you are responsible for ensuring that what you are doing is legal. Do not assume that just because we believe a book is in the public domain for users in the United States, that the work is also in the public domain for users in other countries. Whether a book is still in copyright varies from country to country, and we can't offer guidance on whether any specific use of any specific book is allowed. Please do not assume that a book's appearance in Google Book Search means it can be used in any manner anywhere in the world. Copyright infringement liability can be quite severe.

**About Google Book Search**

Google's mission is to organize the world's information and to make it universally accessible and useful. Google Book Search helps readers discover the world's books while helping authors and publishers reach new audiences. You can search through the full text of this book on the web at `http://books.google.com/`

[illegible]

For the University of Oxford,
England,

with the author's best wishes.

Philadelphia,
September 10th, 1872.

# ELEMENTS

OF

# PATHOLOGICAL ANATOMY.

BY

SAMUEL D. GROSS, M.D.,

PROFESSOR OF SURGERY IN THE JEFFERSON MEDICAL COLLEGE OF PHILADELPHIA:
AND FORMERLY PROFESSOR OF PATHOLOGICAL ANATOMY IN THE
MEDICAL DEPARTMENT OF THE CINCINNATI COLLEGE.

THIRD EDITION,

MODIFIED AND THOROUGHLY REVISED.

Illustrated by Three Hundred and Forty-two Engravings on Wood.

BIBLIOTHECA BODLEIANA

PHILADELPHIA:
BLANCHARD AND LEA.
1857.

165. e. 15.

Entered according to the Act of Congress, in the year 1857, by
SAMUEL D. GROSS, M. D.,
in the Clerk's Office of the District Court of the United States in and for the Eastern District of Pennsylvania.

PHILADELPHIA:
T. K. AND P. G. COLLINS, PRINTERS.

TO

# DANIEL DRAKE, M.D.,

PROFESSOR OF MEDICINE IN THE UNIVERSITY OF LOUISVILLE, ETC. ETC.,

Distinguished alike as an accomplished and successful teacher, an erudite and skilful physician, a zealous promoter of science and literature, and an ardent friend of pathological anatomy, the following pages, intended to illustrate one of the fundamental branches of medical science, are respectfully inscribed, as a testimony of esteem for his exalted talents and attainments, and as a token of sincere regard for his character,

By his Friend and Colleague,

THE AUTHOR.

# PREFACE TO THE THIRD EDITION.

THE present edition of this work has been materially modified, and fully brought up, in so far at least as appertains to what may be considered as really worthy of acceptance, to the existing state of the science of which it treats. All that related to histology and diagnosis, in the preceding edition, has been omitted in this; many paragraphs, and often whole pages, have been rewritten; and a considerable amount of new matter has been introduced. While the general arrangement remains the same, the various topics embraced in the work have been more thoroughly systematized, and, wherever it was practicable, the language has been rendered more concise and terse. One hundred and thirty new cuts have been added. They were drawn, for the most part, from my own specimens, and under my immediate superintendence, by Mr. Daniels, and engraved by Mr. Baxter. These, added to those in the former edition, make the number of original cuts nearly two hundred. The remainder have been copied from various sources, as Reynaud, Marcet, Lawrence, Miller, Curling, Churchill, Bird, and others. Not a few of the figures thus borrowed have become, as it were, the common property of the profession, and are no longer traceable to their respective authors. With the many changes and improvements now introduced, the work may be regarded almost as a new treatise.

It affords me pleasure to state that, in the preparation of this edition, I have had the kind assistance of Dr. J. DaCosta, Lecturer on Medicine in the Philadelphia Association for Medical Instruction, whose contributions to pathological science have placed him in the front rank of the pathological anatomists of this country. A number of the topics discussed in the work are illustrated by drawings founded upon his own researches; and whatever relates to minute structure has received his special attention. While he has thus relieved me of no inconsiderable labor, he has, I am sure, not a little enhanced the value of the work.

In submitting to the profession a new edition of this treatise, I flatter myself that it may, at least, have the effect of arousing their attention to the importance of a more thorough study of a department of medical science which has made such astonishing progress within the last quarter of a century, and whose value, especially in a diagnostic point of view, is now universally acknowledged by every enlightened practitioner. That America, with its great hospital facilities, should have no school of pathological anatomy, is an anomaly which cannot fail to excite the wonder of the age, and the amazement of posterity. In the forty-five medical colleges which, at this moment, exist in the United States, there is not, with perhaps a few exceptions, a chair of pathological anatomy; thus clearly showing that the teachers connected with these institutions have either no very exalted opinion of the value of this science, or that they are afraid of innovation. While almost everything else is taught, from a sesamoid bone and a globule of blood the $\frac{1}{3000}$th part of an inch in diameter, up to the skeleton of the mastodon, hardly a solitary voice is heard, during the whole session of our colleges, in favor of pathological anatomy. This is a strange and culpable oversight, and one which should be speedily corrected. We may cram our pupils with healthy anatomy, physiology, materia medica, chemistry, and, in short, everything else embraced in our curriculum of study, and yet, if we neglect to instruct them in this branch of knowledge, it will be in vain for us to attempt to make good diagnosticians and practitioners of them. Let us, then, while we hope for better things, endeavor soon to extricate ourselves, as the representatives of a great and noble profession, from the false position in which we now stand in relation to this all important science, and its application to the nature, discrimination, and treatment of disease.

The dedication of the work remains as it appeared in the former editions, when I was engaged in working, side by side, with the illustrious man to whom it refers, and whose name has since become classical. Daniel Drake was one of the earliest friends and patrons of pathological anatomy in the United States. The chair of pathological anatomy which he was instrumental in creating in the Cincinnati College, I had the honor of occupying for four years; and it was there that the first attempt was made, in this country, to teach this science upon a systematic and extended plan. Subsequently he was himself, for a time, similarly employed in the University of Louisville; a school which owes much of its former renown to his labors, talents, and reputation.

S. D. GROSS.

PHILADELPHIA, July 1, 1857.

# CONTENTS.

---

## PART I.

## GENERAL PRINCIPLES OF PATHOLOGICAL ANATOMY.

### CHAPTER I.

### INFLAMMATION.

Preliminary Observations.—Fluids and Solids.—Different kinds of Sympathy.—Disease, functional and organic.—Inflammation, how modified by Temperament, Age, Sex, Habit, Climate, Season, the nature of the exciting cause, and the character of the tissue; acute and chronic; does not occur with equal frequency in all parts of the body; common and specific.—Nature, symptoms, and seat of ordinary Inflammation; Redness, Heat, Pain, and Swelling; Derangement of the Vital Actions; Structure of the Capillaries; joint agency of the Vascular and Nervous Systems; altered Sensibility; preternatural influx of Blood; Congestion; Theories of Boerhaave, Cullen, Vacca, and others. Terminations and Conditions of Inflammation . . . . . . . . . . . . PAGE 33

### CHAPTER II.

### EFFUSION OF SERUM.

Occurs, to a greater or less extent, in almost every Inflammation.—Œdema, Anasarca, and Dropsy.—Color, consistence, quantity, and chemical composition.—Usually the result of a mild degree of Inflammation.—Conclusion . . . . . . . 59

### CHAPTER III.

### LYMPHIZATION.

Always the result of Inflammation.—Physical properties of Lymph.—Quantity.—Varieties of Form.—Chemical Constitution.—Period at which the Deposition commences.—Has a tendency to become organized.—How this is effected.—Analogous Tissues.—Use of Lymph as a means of Restoration.—Adhesive Action . . . . . . . 63

### CHAPTER IV.

### SUPPURATION.

Definition.—Organs in which it is most easily effected.—May take place without Solution of Continuity.—Varieties of Form.—Abscesses.—Physical and Chemical Properties of Pus.—Distinguishing Tests.—How produced . . . . . . . 72

## CHAPTER V.

### HEMORRHAGE.

The subject still involved in obscurity.—Causes.—Opinions of Morgagni and Bichât; Exhalant Vessels.—Aptitude of different Structures.—Nomenclature.—Predisposition.—Hereditary Proclivity.—Hemorrhage sometimes vicarious.—Active and passive.—Critical.—Quantity of Blood effused.—Changes and final Disposition . . . . . PAGE 82

## CHAPTER VI.

### SOFTENING.

One of the most unequivocal signs of inflammation.—Structure most liable to be affected by it.—In what anatomical element is the lesion seated?—Causes.—Degrees of softening 87

## CHAPTER VII.

### GANGRENE.

Definition.—Parts most apt to suffer.—Color and Consistence.—Extent.—Manner in which Nature guards against the occurrence of Hemorrhage.—Causes, of two kinds.—Malignant Pustule.—Gangrene from the use of Ergot.—From the exhibition of Tartar Emetic.—Senile Gangrene.—Opinions as to its cause . . . . . . . 89

## CHAPTER VIII.

### ULCERATION.

Definition; intricate Nature—Most common in the Skin, Cellular Tissue, and Mucous Membranes.—May be slow or rapid.—Manifests a tendency to extend towards the nearest surface.—Produced by Inflammation.—Influenced by an impoverished state of the Blood.—Ulcers sometimes heal; the process by which this is accomplished.—Ulceration a sanative effort 95

## CHAPTER IX.

### GRANULATION.

Importance of the Subject.—Nature of Granulations.—Difference in regard to their Vascularity and Sensibility.—How modified by Texture.—Are Secreting and Absorbing organs 98

## CHAPTER X.

### CICATRIZATION.

Nature of the Process.—Different Steps.—Do Ulcers ever heal from the Centre?—Process of Cicatrization influenced by the Form and Situation of the Sore.—Meaning of the term Cicatrice.—Reproduction of the original Tissues.—Transformations of Cicatrices . 101

## CHAPTER XI.

### INDURATION.

Definition.—Color, Size, Weight, and Degree.—Period necessary for its production.—Causes 104

## CHAPTER XII.

### HYPERTROPHY.

Meaning of the term.—Liability of different Structures.—Causes.—May be general or local.—Color, Weight, and Volume of the Part affected . . . . . . 108

## CHAPTER XIII.

### ATROPHY.

Definition.—May be General or Partial.—Causes: want of Exercise; Diminution of the Nervous Influence; Deficient supply of Blood; Inflammation . . . . Page 111

## CHAPTER XIV.

### FISTULES.

Definition.—Distinction into Complete and Partial.—Most common Situation.—Nomenclature.—Length and Diameter.—External and Internal Orifices.—Direction.—Lined by Adventitious Organized Membrane.—Nature of the Discharge.—State of the adjoining Tissues.—Causes . . . . . . . . . . . . 114

## CHAPTER XV.

### TRANSFORMATIONS.

The Body in a constant state of Mutation.—Number of Transformations: the Cellular, Mucous, Cutaneous, Fibrous, Cartilaginous, Osseous and Adipose . . . . . 117

## CHAPTER XVI.

### PNEUMATOSIS, OR COLLECTIONS OF AERIFORM FLUIDS.

Definition.—Frequency.—Names by which it is known.—Form and Extent.— Physical and Chemical Properties.—Causes.—Effects on neighboring Organs.—Most frequent in the Female.—Duration.—May be expelled or absorbed . . . . . . 122

## CHAPTER XVII.

### POLYPES.

Most common Situation.—Not peculiar to the Human Subject.—Number, Size, and Form.—Structure and Varieties.—Vesicular, Fibrous, Vascular, and Granular.—May degenerate in different ways.—Period of Life most liable to their Formation.—Effects on contiguous Structures.—True Character.—Are always covered by a Mucous Membrane . . . 128

## CHAPTER XVIII.

### HYDATIDS.

Where found.—Classification of Hydatids.—The Cysticercus, Polycephalus, Diceras, Echinococcus, and Acephalocystis.—Their Origin and Organization.—The manner in which they are nourished.—The Changes which they experience by Age, and the Alterations they induce in the Organs in which they are developed . . . . . . 135

## CHAPTER XIX.

### SEROUS CYSTS.

Have the form of Shut Sacs.—Organs in which they are most frequently found.—Classification: the Simple, Multilocular, and the Included.—Nature of the Contained Fluid.—Are either new Products, or formed out of the pre-existing Textures.—Are liable to Inflammation and its Consequences . . . . . . . . . . . 143

## CHAPTER

### HEMORRHAGF

The subject still involved in obscurity.—Causes.—O
Vessels.—Aptitude of different Structures.—N
Proclivity.—Hemorrhage sometimes vicarious.—
Blood effused.—Changes and final Disposition

## CHAP

### SO

One of the most unequivocal signs of in
it.—In what anatomical element is th

## CH

Definition.—Parts most apt to
Nature guards against the o
Pustule.—Gangrene from t
Senile Gangrene.—Opinion

## XX.

### TIONS

anosis; Scirrhus; Encephaloid; Col-
at frequency.—Occurs nearly in all
r Animals.—Chemical Composition.
ular Matter.—Notions respecting its
nd Excavations.—II. *Melanosis.*—His-
mical Analysis.—Color and Consistence.
r from Melanotic Diathesis.—States of the
II. *Scirrhus.*—Difficulty of the Subject.—
nstitution.—Rarely appears before the age of
—*Is* apt to Ulcerate and involve the general
allied to Scirrhus.—Terms by which it has been
uctures than in others.—Varieties of Form.—Color,
zation and Mode of Origin.—A Disease of early Life.
nation.—V. *Colloid.*—First described by Laennec.—
Formation.—Composed of two Elements.—Microscopical
ssels, and Nerves.—Chemical Constitution.—Varieties of
—*Most* frequent from Thirty-five to Fifty.—Mode of Origin
*Cancer.*—Its Nature, Organization, and Tendency PAGE 147

Definition; intricate N
branes.—May be sl
—Produced by In
sometimes heal;

# PART II.

# SPECIAL PATHOLOGICAL ANATOMY.

Importance
and Sens

## CHAPTER I.

### BLOOD.

of the Blood.—Nature and Formation of the Buffy Coat.—Cupped Appearance of the
—Want of Coagulability.—Relative Quantity of Fibrin in Healthy and Diseased Blood.
Alterations of the Hematosine.—Lesions of the Serum, in Inflammation, Dropsy, and other
Maladies.—Changes of the Blood, from Acceleration of the Circulation and Division of the
Natu Pneumogastric Nerves.—Appearances in Cholera, Fever, Chlorosis and Scurvy . 197
C

## CHAPTER II.

### CELLULAR TEXTURE.

Lesions.—Acute Inflammation.—Suppuration.—Gangrene.—Chronic Inflammation.—Induration.—Serous Infiltration.—Emphysema.—Degenerations.—Foreign Substances.—Guinea Worm . . . . . . . . . . . . . . 218

## CHAPTER III.

### ADIPOSE TEXTURE.

Lesions of the Adipose Tissue.—Wounds.—Liability to Inflammation.—Hypertrophy, genera and local.—Adipose Diathesis.—Atrophy . . . . . . . . 223

## CHAPTER IV.

### MUSCULAR SYSTEM.

—Reunite when divided.—Inflammation.—Suppuration.—Mortification.—Chronic Softening.—Induration.—Ossification.—Fibrous and Fatty Transformations.—posits.—Hypertrophy.—Atrophy.—Parasitic Animals.—Sanguineous Effu- *endons*.—Reunite when divided.—Inflammation.—Ossification.—Atrophy.— the Sheaths of the Tendons.—III. *Aponeuroses*.—Acute and Chronic Inflamma- V. *Synovial Burses*.—Diseases.—Fibro-cartilaginous Concretions.—Hypertrophy.— oid Bodies . . . . . . . . . PAGE 227

## CHAPTER V.

### ARTERIES.

Lesions.—Wounds.—Inflammation.—Suppuration.—Ulceration.—Gangrene.—Softening.—Induration.—Hypertrophy.—Morbid—Deposits.—Contraction.—Aneurism . . 238

## CHAPTER VI.

### VEINS.

Lesions.—Acute Inflammation.—Suppuration.—Ulceration.—Chronic Inflammation.—Dilatation.—Obliteration.—Calcareous Deposits.—Phlebolites.—Admission of Air . 257

## CHAPTER VII.

### LYMPHATIC VESSELS AND GANGLIONS.

I. *Lymphatic Vessels*.—Liability to Inflammation and Suppuration.—Tubercular Deposits.—Dilatation.—Aneurism of the Thoracic Duct.—II. *Lymphatic Ganglions*.—Lesions.—Inflammation and its ordinary Consequences.—Hypertrophy.—Encephaloid Disease.—Tubercle.—Ossification.—Melanosis . . . . . . . . . . 262

## CHAPTER VIII.

### JOINTS.

I. *Articular Cartilages*.—Lesions.—Reparation.—Inflammation.—Softening.—Suppuration.—Ulceration.—Ossification.—II. *Synovial Membranes*.—Diseases: Inflammation.—Effusion of Lymph and Pus.—Ulceration.—Chronic Irritation.—Loose Cartilages.—Chalky Concretions.—III. *Ligaments*.—Adhesive Inflammation.—Atrophy.—Calcareous Concretions 269

## CHAPTER IX.

### OSSEOUS SYSTEM.

I. *Bones*.—Diseases.—Reparation.—Inflammation.—Suppuration.—Ulceration.—Gangrene.—Softening.—Rachitis.—Fragility.—Hypertrophy.—Atrophy.—Hydatids.—Aneurism.—Carcinoma.—Melanosis.—Tubercle.—II. *Periosteum*.—Its Fibrous Structure liable to the same kind of Diseases as the Fibrous Membranes generally.—Hypertrophy.—Ossification.—Is seldom, if ever, affected by the Heterologous Formations.—III. *Medullary Membrane*.—Diseases few, but important . . . . . . . . . 276

## CHAPTER XX.

### HETEROLOGOUS FORMATIONS.

**Preliminary Observations.—Classification ; Tubercle ; Melanosis ; Scirrhus ; Encephaloid ; Colloid ; Epithelial Cancer.—I. *Tubercle.*—Definition.—Great frequency.—Occurs nearly in all Tissues, and at all Periods of Life.—Is common in the lower Animals.—Chemical Composition.—Varieties of Form.—Concrete and semi-concrete Tubercular Matter.—Notions respecting its Origin, Development, and Organization.—Softening and Excavations.—II. *Melanosis.*—Historical Sketch.—Occurs in Man and Animals.—Chemical Analysis.—Color and Consistence.—Varieties of Form.—Tissues most liable to suffer from Melanotic Diathesis.—States of the System which predispose to its formation.—III. *Scirrhus.*—Difficulty of the Subject.—Definition.—Varieties of Form.—Chemical Constitution.—Rarely appears before the age of thirty.—Most common in Glandular Organs.—Is apt to Ulcerate and involve the general System.—IV. *Encephaloid.*—Is intimately allied to Scirrhus.—Terms by which it has been designated.—More frequent in some Structures than in others.—Varieties of Form.—Color, Consistence, and Composition.—Organization and Mode of Origin.—A Disease of early Life.—Involves the whole System.—Termination.—V. *Colloid.*—First described by Laennec.—Different Names.—Is a distinct Formation.—Composed of two Elements.—Microscopical Characters.—Cellular Tissue, Vessels, and Nerves.—Chemical Constitution.—Varieties of Form.—Most common Situation.—Most frequent from Thirty-five to Fifty.—Mode of Origin and Progress.—VI. *Epithelial Cancer.*—Its Nature, Organization, and Tendency**
PAGE 147

---

# PART II.

## SPECIAL PATHOLOGICAL ANATOMY.

## CHAPTER I.

### BLOOD.

**Lesions of the Blood.—Nature and Formation of the Buffy Coat.—Cupped Appearance of the Blood.—Want of Coagulability.—Relative Quantity of Fibrin in Healthy and Diseased Blood.—Alterations of the Hematosine.—Lesions of the Serum, in Inflammation, Dropsy, and other Maladies.—Changes of the Blood, from Acceleration of the Circulation and Division of the Pneumogastric Nerves.—Appearances in Cholera, Fever, Chlorosis and Scurvy . 197**

## CHAPTER II.

### CELLULAR TEXTURE.

**Lesions.—Acute Inflammation.—Suppuration.—Gangrene.—Chronic Inflammation.—Induration.—Serous Infiltration.—Emphysema.—Degenerations.—Foreign Substances.—Guinea Worm . . . . . . . . . . . . . . 218**

## CHAPTER III.

### ADIPOSE TEXTURE.

**Lesions of the Adipose Tissue.—Wounds.—Liability to Inflammation.—Hypertrophy, genera and local.—Adipose Diathesis.—Atrophy . . . . . . . . 223**

## CHAPTER IV.

### MUSCULAR SYSTEM.

I. *Muscles.*—Reunite when divided.—Inflammation.—Suppuration.—Mortification.—Chronic Irritation.—Softening.—Induration.—Ossification.—Fibrous and Fatty Transformations.—Heterologous Deposits.—Hypertrophy.—Atrophy.—Parasitic Animals.—Sanguineous Effusions.—II. *Tendons.*—Reunite when divided.—Inflammation.—Ossification.—Atrophy.—Diseases of the Sheaths of the Tendons.—III. *Aponeuroses.*—Acute and Chronic Inflammation.—IV. *Synovial Bursæ.*—Diseases.—Fibro-cartilaginous Concretions.—Hypertrophy.—Hydatoid Bodies . . . . . . . . . . PAGE 227

## CHAPTER V.

### ARTERIES.

Lesions.—Wounds.—Inflammation.—Suppuration.—Ulceration.—Gangrene.—Softening.—Induration.—Hypertrophy.—Morbid—Deposits.—Contraction.—Aneurism . . 238

## CHAPTER VI.

### VEINS.

Lesions.—Acute Inflammation.—Suppuration.—Ulceration.—Chronic Inflammation.—Dilatation.—Obliteration.—Calcareous Deposits.—Phlebolites.—Admission of Air . 257

## CHAPTER VII.

### LYMPHATIC VESSELS AND GANGLIONS.

I. *Lymphatic Vessels.*—Liability to Inflammation and Suppuration.—Tubercular Deposits.—Dilatation.—Aneurism of the Thoracic Duct.—II. *Lymphatic Ganglions.*—Lesions.—Inflammation and its ordinary Consequences.—Hypertrophy.—Encephaloid Disease.—Tubercle.—Ossification.—Melanosis . . . . . . . . . . . 262

## CHAPTER VIII.

### JOINTS.

I. *Articular Cartilages.*—Lesions.—Reparation.—Inflammation.—Softening.—Suppuration.—Ulceration.—Ossification.—II. *Synovial Membranes.*—Diseases: Inflammation.—Effusion of Lymph and Pus.—Ulceration.—Chronic Irritation.—Loose Cartilages.—Chalky Concretions.—III. *Ligaments.*—Adhesive Inflammation.—Atrophy.—Calcareous Concretions 269

## CHAPTER IX.

### OSSEOUS SYSTEM.

I. *Bones.*—Diseases.—Reparation.—Inflammation.—Suppuration.—Ulceration.—Gangrene.—Softening.—Rachitis.—Fragility.—Hypertrophy.—Atrophy.—Hydatids.—Aneurism.—Carcinoma.—Melanosis.—Tubercle.—II. *Periosteum.*—Its Fibrous Structure liable to the same kind of Diseases as the Fibrous Membranes generally.—Hypertrophy.—Ossification.—Is seldom, if ever, affected by the Heterologous Formations.—III. *Medullary Membrane.*—Diseases few, but important . . . . . . . . . . 276

## CHAPTER X.

### CUTANEOUS SYSTEM.

I. *Skin.*—Reproductive Power of the different Lamellæ of the Skin.—Diseases.—(I.) Unclassifiable Lesions. — Keloid. — Eiloid. — Lepoid. — Melanosis. — Encephaloid. — Scirrhous Tumors.— Hypertrophy.—Corns.—Warts.— Horny Excrescences. — Gangrene.— Sebaceous Tumors.—Hemorrhages.—(II.) Classifiable Lesions.—1. Exanthematous Diseases.—2. Pustular.—3. Papular.—4. Bullar.—5. Tubercular.—6. Scaly.—7. Syphilitic Diseases.—8. Stains. —II. *Nails.* — Reproductive Power. — Inordinate Length.—Absence. — Malformation.— Vicious Situation.—Onyxitis.—III. *Hairs.*—Similarity to the Nails.—Polish Plait.—Regenerating Power.—Hypertrophy.—Female Beards.—Softening.—Fragility.—Changes of Color. —Accidental Development of Hair . . . . . . . PAGE 302

## CHAPTER XI.

### NERVOUS SYSTEM.

I. *Lesions of the Brain.*—Wounds.—Encephalitis.—Suppuration.—Abscesses.—Gangrene.— Softening.—Chronic Inflammation. — Induration.—Ulceration.—Sanguineous Effusions.— Hypertrophy and Atrophy.—Tubercles.—Melanosis.—Encephaloid.—Cartilaginous Formations.—Calcareous Deposits.—Cysts and Hydatids.—II. *Lesions of the Cerebral Envelops.*— Inflammation of the Dura Mater.—Suppuration.—Fibrous Tumors.—Bony Deposits.—Hypertrophy of the Glands of Pacchioni.—Arachnitis.—Hydrocephalus.—Tubercles.—Diseases of the Pia Mater.—III. *Lesions of the Spinal Cord.*—Inflammation. —Heterologous Formations. — Hydro-rachitis. — IV. *Lesions of the Nerves.* — Restorative Power. — Neuritis. —Suppuration.—Ulceration.—Hypertrophy and Atrophy.—Diseases of the Nervous Ganglia 338

## CHAPTER XII.

### EYE.

I. *Lesions of the Lachrymal Apparatus.*—Lachrymal Gland.—Ducts and Sac.—II. *Lesions of the Ball of the Eye.* — The Conjunctiva. — Pterygium. — Lachrymal Caruncle. — Acute Corneitis.—Ulceration and Ossification of the Cornea.—Fleshy Excrescences.—Alterations of Form. — Diseases of the Sclerotica. — Choroid Tunic. — The Retina. — Amaurosis. — Optic Nerve.—Membrane of Demours.—Hæmophthalmus.—Lesions of the Iris.—Alterations of the Pupil.—Capsule of the Crystalline Lens.—Liquor of Morgagni.—Varieties of Cataract. —Vitreous Humor.—Heterologous Formations . . . . . . 371

## CHAPTER XIII.

### EAR.

Malformations of the External Ear.—Polypous Growths—Lesions of the Tympanum.—Bones of the Ear.—Eustachian Tube.—The Labyrinth and Vestibule.—Diseases of the Auditory Nerve . . . . . . . . . . . . . 387

## CHAPTER XIV.

### THYMUS GLAND.

Weight and Size.—Development and Decay.—Hypertrophy.—Thymic Asthma.—Inflammation.—Ulceration.—Scirrhus.—Tubercular Deposits.—Ossification.—Steatomatous degeneration . . . . . . . . . . . . . 391

## CHAPTER XV.

### THYROID GLAND.

Acute Inflammation. — Suppuration. — Goitrous Enlargement. — Sanguineous Effusions. — Atrophy.—Tubercular Deposits.—Scirrhus . . . . . . Page 393

## CHAPTER XVI.

### RESPIRATORY APPARATUS.

I. *Lesions of the Air-Passages.*—Inflammation of the Larynx.—Membranous Croup.—Œdema of the glottis.—Ossification of the Laryngeal Cartilages.—Polypous Growths.—Warty Excrescences.—Tubercles and Hydatids.—Tracheitis.—Stricture.—Dilatation.—Inflammation of the Bronchiæ. Dilatation.—Contraction.—Flattening.—II. *Lesions of the Lungs.* —Acute Inflammation. — Hepatization.—Abscess. — Gangrene. — Chronic Pneumonitis. — Carnification.—Œdema.—Emphysema.—Apoplexy. — Encephaloid Disease. — Melanosis.— Serous Cysts.—Hydatids.—Calcarerous Concretions.—Hypertrophy.—Atrophy.—Tubercular Phthisis.—III. *Lesions of the Pleura.*—Acute Inflammation.—Formation of Matter.—Gangrene.—Chronic Pleuritis.—Ossification.—Accumulation of Gas.—Ulceration.—Tubercular Deposits . . . . . . . . . . . . . 397

## CHAPTER XVII.

### HEART AND ITS MEMBRANES.

I. *Lesions of the Pericardium.*—Inflammation.—Hydro-pericardium.—Formation of Matter and Deposits of Lymph.—Effusion of Blood.—Accumulation of Air.—Serous Cysts.—Congenital Absence.—II. *Lesions of the Heart.*—Situation, Weight, and Dimensions.—Acute Carditis.—Collections of Pus.—Ulceration.—Inflammation seldom or never ends in Gangrene.—Softening.—Induration.—Cartilaginous and Osseous Degenerations.—Scirrhus and Encephaloid.—Fatty Transformation.—Sanguineous Effusions.—Serous Cysts.—Hydatids.— Atrophy.—Dilatation.—Aneurism.—Hypertrophy.—Malformations.—III. *Lesions of the Endocardium.*—Acute Inflammation.—Thickening.—Wart-like Excrescences.—Fibro-Cartilaginous, Cartilaginous, and Osseous Transformations.—Fibrinous Concretions . 448

## CHAPTER XVIII.

### NASAL, MAXILLARY, AND FRONTAL CAVITIES.

I. *Nasal Cavity.*—Deviations from the Normal Standard.—Nasal Septum.—Inflammation of the Schneiderian Membrane.—Epistaxis.—Different kinds of Polypes.—Obstruction of the Mucous Follicles.—II. *Maxillary Sinus.*—Purulent Accumulations.—Ulceration of its Lining Membrane.—Polypous Growths.—Carcinoma.—Exostoses.—III. *Lesions of the Frontal Sinus* . . . . . . . . . . . . . 473

## CHAPTER XIX.

### MOUTH, PHARYNX, AND ŒSOPHAGUS.

I. *Diseases of the Lips.*—Carcinoma, Encysted Tumors, and Congenital Fissure.—Malformations of the Jaw.—II. *Glossitis.*—Ulceration, Hypertrophy, and Cancer of the Tongue.— Congenital Deficiencies.—III. *Salivary Glands.*—Parotitis.—Atrophy and Hypertrophy.— Scirrhus.—Calcareous Concretions.—Ranula.—Fatty Degeneration.—Morbid Alterations.— IV. *The Teeth.*—Caries.—Gangrene.—Inflammation of their Internal Membrane.—Fungous Tumors.—Exostoses.—Denuding Process.—Deposits of Tartar.—Congenital Vices.—V.

*The Gum.*—Liability to Inflammation.—Epulis.—Ulcerative Absorption.—Mortification.—Alveolar Abscess.—VI. *Diseases of the Tonsils.*—VII. *The Soft Palate and Uvula.*—VIII. *The Pharynx.*—Diphtheritis.—Polypes.—Sacculated Condition.—IX. *Œsophagitis.*—Ulceration.—Softening.—Stricture.—Scirrhus.—Laceration.—Congenital Malformations Page 478

## CHAPTER XX.

### STOMACH AND BOWELS.

I. Consistence and Color *of the Gastro-Enteric Mucous Membrane;* how modified by Age, Digestion, and other circumstances.—II. *Inflammation.*—Anatomical Characters of the Acute Form of the Disease.—Increased Vascularity.—Dryness.—Thickening.—Softening.—Deposition of Lymph.—Formation of Vesicles.—Effusion of Blood and Serum.—May pass into Gangrene or become Chronic.—III. *Softening;* of two kinds, from Inflammation, and the Action of the Gastric Juice.—IV. *Diseases of the Stomach.*—Ulceration.—Hypertrophy and Atrophy.—Formation of Pouches.—Cartilaginous Degeneration.—Carcinoma.—Laceration.—V. *Lesions of the Duodenum.*—VI. *Affections of the Small Bowels,* properly so called. Ulceration of the isolated Crypts and of the Glands of Peyer.—Typhoid Fever.—Infantile Cholera.—Tubercular Deposits.—Melanosis.—Intussusception.—Hernia.—Abnormal Pouches.—Repair of Wounds.—Atrophy and Hypertrophy.—Earthy Concretions.—VII. *Lesions of the Large Bowel.*—Ulcers.—Wart-like Vegetations.—Singular Contraction of the Colon.—VIII. *Vermiform Appendage.*—IX. *Recto-Anal Region.*—Carcinoma.—Fissure of the Anus.—Enlargement of Pouches.—Organic Stricture of the Rectum.—Polypes.—Hemorrhoids.—Fistule.—Prolapse of the Bowel.—Congenital Vices.—X. *Intestinal Worms.*—Lumbricoides.—Oxyuris.—Tricocephalus.—Tænia Solium.—Tænia Lata . . 500

## CHAPTER XXI.

### PERITONEUM.

Is liable to different forms of Disease.—Acute Inflammation.—Deposition of Lymph.—Effusion of Serum, Pus, and Blood.—Softening of Subserous Cellular Tissue.—Parts of the Membrane most apt to suffer.—Development of Vesicles.—Chronic Irritation.—Agglutination of the Bowels and formation of False Passages.—Ascitic Effusions.—Generation of Gas.—Tubercles.—Carcinomatous Growths . . . . . . . . . . 585

## CHAPTER XXII.

### BILIARY APPARATUS.

I. *The Liver.*—Weight, Color, and Analysis.—Lesions.—Inflammation.—Suppuration and Abscess.—Gangrene.—Softening.—Induration.—Hypertrophy and Atrophy.—Cirrhosis.—Tubercles.—Carcinoma.—Melanosis.—Hydatids.—Adipose Transformation.—The Liver Fluke, and other Worms.—Cartilaginous Degeneration.—Osseous Concretions.—Sanguineous Effusions.—Erectile Tumor.—Restorative Powers of the Liver.—II. *The Gall-Bladder.* Inflammation.—Ulceration and Rupture.—Atrophy and Thickening of its Coats.—Diseases of the Biliary Ducts.—Alterations of the Bile.—Gall-stones . . . . . 594

## CHAPTER XXIII.

### SPLEEN.

Relations, Weight, and Size.—Acute Splenitis.—Anatomical Characters.—May pass into Suppuration or into Gangrene.—Softening.—Induration and Hepatization.—Hypertrophy and Atrophy.—Tubercles.—Calcareous Concretions.—Fibro-Cartilaginous and Osseous Matter.—Hydatids and Serous Cysts.—Sanguineous Deposits.—Laceration . . . . 619

## CHAPTER XXIV.

### PANCREAS.

Is liable to pretty much the same Diseases as the Salivary Glands.—Rarely the seat of Acute Inflammation.—Atrophy.—Hypertrophy.—Is sometimes affected with Scirrhus.—Encephaloid.—Melanosis.—Fatty Transformation.—Serous Cysts.—Tubercular Deposits.—Sanguineous Effusion.—Earthy Concretions . . . . . . . PAGE 626

## CHAPTER XXV.

### URINARY APPARATUS.

I. *Supra-renal Capsules.*—II. *The Kidneys.*—Observations on their Congenital Vices.—Lesions of their Fibrous Covering.—Pyelitis, Acute and Chronic.—Nephritis, Acute and Chronic.—Abscesses.—Softening.—Induration.—Gangrene seldom or never observed.—Bright's Disease.—Scirrhus and Encephaloid.—Tubercles.—Melanosis.—Erectile Tissues.—Serous Cysts.—Hydatids.—Fibro-Cartilaginous, Osseous, and Fatty Degenerations.—Enlargement and Atrophy.—Rupture.—Renal Calculi.—The Strongylus.—III. *The Ureter.*—Liable to Deposits of Tubercular Matter.—Effusion of Lymph, Thickening and Attenuation of its Parietes, with Contraction or Enlargement of its Cavity.—IV. *The Urinary Bladder.*—Is rarely affected with acute Inflammation, Suppuration, Softening, or Gangrene.—Hypertrophy of the Mucous and Muscular Tunics.—Developments of Cysts.—Ulceration.—Encephaloid Disease.—Tubercle.—Neuralgia.—Rupture.—Worms.—Morbid Urine.—Urinary Deposits.—Calculous Concretions.—V. *The Prostate Gland.*—Is liable to various forms of Disease.—Inflammatory Abscess, Chronic Enlargement, Tubercles, Melanosis, Encephaloid, and Calculi . . . . . . . . . . 631

## CHAPTER XXVI.

### MALE ORGANS OF GENERATION.

I. *The Testicle.*—Weight and Volume.—Diseases of its Vaginal Tunic.—Inflammation.—Hydrocele.—Hæmatocele.—Earthy Concretions.—Orchitis.—Malignant Affections of the Testicle.—Tubercles and Hydatids.—Hypertrophy and Atrophy.—II. *The Spermatic Cord.*—Encysted Dropsy.—Varicocele.—Neuralgia.—III. *The Seminal Vesicles.*—Their Lesions, few in number and still involved in obscurity.—Tubercles.—Earthy Concretions.—IV. *The Scrotum.*—Carcinoma.—Excessive Enlargement.—Is sometimes affected with a peculiar Sloughing Ulcer.—Contains Foreign Substances, such as Teeth, Hair, and pieces of Bone.—Earthy Concretions.—V. *The Penis.*—Gonorrhœa.—Gleet.—Chordee.—Organic Stricture.—Abscess along the Course of the Urethra.—Malformations of this Tube.—Imperforation.—Morbid Erection of the Penis.—Degeneration of the Pectiniform Septum and Fibrous Sheath.—Carcinoma.—Syphilitic Ulceration.—Herpetic Affections.—Warty Excrescences.—Phymosis and Paraphymosis.—Sometimes Seat of Calculous Concretions . . 683

## CHAPTER XXVII.

### FEMALE ORGANS OF GENERATION.

I. *The Uterus.*—Observations on its Weight and Volume.—Liable to Malformations.—Retroversion.—Prolapse and Inversion.—Is apt to suffer from Inflammation, both of its Lining Membrane, its serous Covering, and its proper Tissue.—Remarks on Uterine Phlebitis.—Softening.—Induration.—Atrophy.—Fibrous Tumors.—Different Species of Polypes.—Calcareous Concretions.—Transformation of the Uterine Tissue into Cartilage and Bone.—Malignant Diseases.—Encephaloid and Scirrhus.—Tubercular Deposits.—Rupture.—Hemorrhage.—Accumulation of Air.—Hairs.—Obstructions of the Mouth of the Womb.—Hydatids.

—Uterine Moles. II. *The Ovaries.*—Their Disorders are numerous and important.—Osseous Transformations.—Serous Cysts and Hydatids.—Scirrhus.—Occasionally contain Teeth, Hair, and Fragments of Bone.—Hemorrhage.—Remarks on the Corpora Lutea. III. *The Fallopian Tubes.*—Are seldom affected with Disease. IV. *The Vagina and Vulva.*—Liable to the same kinds of Maladies as other Mucous Structures.—Polypes of the Vagina.—Varices.—Enlargement of its Mucous Follicles.—Vices of Formation.—The Great Labia.—Polypes.—Clitoris.—Nymphæ, and Orifice of the Urethra. V. *The Mammary Gland.*—Is often the seat of Acute and Chronic Inflammation.—Its Diseases, in many respects, resemble those of the Testicle and Ovary. VI. *Placenta and Umbilical Cord.*—Inflammation.—Suppuration.—Softening.—Cartilaginous Degeneration.—Ossification.—Fatty Degeneration.—Hypertrophy.—Tubercles.—Sanguineous Effusions . . PAGE 707

# LIST OF ILLUSTRATIONS.

FIG. PAGE
1. Natural ear of a rabbit . . . . . . . . . 50
2. Inflamed ear of a rabbit . . . . . . . . . 50
3. Change in the capillary circulation in inflammation . . . . 51
4. Inflamed serous membrane . . . . . . . . . 52
5. Inflamed web of a frog's foot . . . . . . . . 52
6. Reticulated arrangement of the corpuscles in inflammatory blood . . 53
7. Plastic corpuscles and filaments in recent lymph exuded on the pleura . 65
8. Recent lymph, forming false membrane . . . . . . 65
9. } Nuclei and cells developing themselves into fibres . . . 68
10. }
11. A perfect fibrous tissue . . . . . . . . . 68
12. Newly-formed vessels in plastic lymph . . . . . . 69
13. False membrane of the pleura . . . . . . . . 69
14. Vessels in a clot of blood . . . . . . . . . 70
15. Natural appearance of pus-corpuscles; and after application of acetic acid 78
16. Pus-corpuscles, magnified 400 diameters . . . . . . 78
17. Mucous pus-globules . . . . . . . . . . 80
18. Gangrene . . . . . . . . . . . 91
19. Senile gangrene . . . . . . . . . . 94
20. Structure of a granulation . . . . . . . . . 100
21. Structure of a cicatrice of the skin . . . . . . . 102
22. Burn of the neck . . . . . . . . . . 104
23. Cellular cysticerce . . . . . . . . . . 136
24. Magnified head of same . . . . . . . . . 136
25. Portion of human muscle with the same inclosed . . . . . 136
26. Vesicular cysticerce . . . . . . . . . . 136
27. Magnified head of same . . . . . . . . . 136
28. Dicystis . . . . . . . . . . . 137
29. Magnified head of same . . . . . . . . . 137
30. Speckled cysticerce . . . . . . . . . . 137
31. Fischerian cysticerce . . . . . . . . . . 137
32. Granular polycephalus . . . . . . . . . 138
33. Small body attached to the inner surface of the animal . . . . 138
34. Rough diceras . . . . . . . . . . 138
35. Echinococcus . . . . . . . . . . . 138
36. Acephalocyst . . . . . . . . . . . 139
37. Young acephalocysts . . . . . . . . . . 140
38. Tubercle-corpuscles . . . . . . . . . . 160
39. Vessels in and around tubercles . . . . . . . 163
40. Fibrous stroma of scirrhus . . . . . . . . . 174

FIG. PAGE

41. Cancer-cells . . . . . . . . . . 174
42. Encephaloid cells . . . . . . . . . 181
43. } Stroma of medullary carcinoma . . . . . . . 182
44. }
45. Colloid tumor . . . . . . . . . 187
46. External appearance of the same . . . . . . . 187
47. Stroma of colloid . . . . . . . . . 187
48. Epithelial cancer . . . . . . . . . 192
49. Epithelial cells . . . . . . . . . 192
50. Epithelial papilla . . . . . . . . . 193
51. Buffy and cupped blood . . . . . . . . 202
52. Filaria medinensis . . . . . . . . . 222
53. Fatty tumor . . . . . . . . . . 225
54. Spiral trichina . . . . . . . . . 233
55. Separate cyst of the same . . . . . . . . 233
56. The same magnified . . . . . . . . 233
57. Fibroid bodies of a ganglion . . . . . . . 236
58. Fibroid bodies of a synovial burse . . . . . . . 238
59. Deposition of calcareous matter . . . . . . . 245
60. Atheromatous deposits . . . . . . . . 246
61. Hypertrophy of the aorta . . . . . . . . 248
62. Sacculated aneurism . . . . . . . . 249
63. Cylindroid aneurism . . . . . . . . 250
64. Varicose artery . . . . . . . . . 250
65. Dissecting aneurism . . . . . . . . 251
66. Arterio-venous aneurism . . . . . . . . 253
67. Anastomotic aneurism . . . . . . . . 254
68. Aneurism of the aorta in progress of obliteration . . . . . 255
69. Obliterated aneurism of the hepatic artery . . . . . 256
70. Fibrinous phlebitis . . . . . . . . . 258
71. Varicose veins . . . . . . . . . 259
72. Obliteration of the vena cava . . . . . . . 260
73. Phlebolites . . . . . . . . . . 260
74. Dilated lymphatics . . . . . . . . . 264
75. Hypertrophy of the lymphatic glands . . . . . . 266
76. Melanosis of a lymphatic gland . . . . . . . 267
77. Cretaceous degeneration of lymphatic glands . . . . . 268
78. Osseous anchylosis of the knee . . . . . . . 271
79. Loose articular concretions . . . . . . . . 274
80. Attached articular concretions . . . . . . . 274
81. Exuberant callus of a broken femur . . . . . . 278
82. Fracture of the arm-bone of a chicken . . . . . . 278
83. Appearance of bone after amputation . . . . . . 279
84. Chronic abscess of the tibia . . . . . . . 281
85. Caries of the tibia . . . . . . . . . 281
86. Caries of the head of the humerus . . . . . . . 282
87. Necrosis of the thigh bone . . . . . . . . 283
88. Madame Supiot . . . . . . . . . 285
89. Rickets . . . . . . . . . . 287
90. General hypertrophy of bone—internal structure . . . . . 289
91. General hypertrophy of bone—external appearance . . . . 289

FIG. PAGE
92. Hypertrophy involving both the thickness and length of bone . . 290
93. Exostosis of the thigh-bone . . . . . . . 290
94. Ivory-like exostosis . . . . . . . . 291
95. Absorption of the humerus . . . . . . . . 292
96. Atrophy of bone . . . . . . . . . 293
97. Atrophy of cellular structure of the thigh-bone . . . . 293
98. Enchondromatous tumor of the ribs . . . . . . 296
99. Encephaloid disease of the thigh-bone . . . . . . 296
100. Change of bone produced by carcinoma . . . . . . 297
101. Colloid tumor . . . . . . . . . . 298
102. Tubercular excavation of the cuneiform bone . . . . 299
103. Keloid growth of the face . . . . . . . . 303
104. Horny excrescence of the scalp . . . . . . . 306
105. Section of a horn . . . . . . . . . . 306
106. Sebaceous tumors of the scalp . . . . . . . 309
107. Cyst of a sebaceous tumor . . . . . . . . 310
108. 109. } Itch insect . . . . . . . . . 325
110. Onyxitis of the great toe . . . . . . . . 335
111. Osseous deposits upon the dura mater . . . . . . 357
112. Carcinoma of the dura mater . . . . . . . 357
113. Bifid spine . . . . . . . . . . 365
114. Bifid spine . . . . . . . . . . 366
115. Section of a neuroma . . . . . . . . 369
116. Hypertrophy of a nervous ganglion . . . . . . 370
117. Granular conjunctivitis . . . . . . . . 374
118. Pterygium . . . . . . . . . . 375
119. Encanthis . . . . . . . . . . 375
120. Corneitis . . . . . . . . . . 376
121. Ulcer of the cornea . . . . . . . . . 376
122. Conical cornea . . . . . . . . . 378
123. Staphyloma . . . . . . . . . . 378
124. Staphyloma of the sclerotic coat . . . . . . . 379
125. Ossification of the choroid . . . . . . . . 380
126. Cellular hydatid . . . . . . . . . 381
127. Iritis . . . . . . . . . . 381
128. Prolapse of the iris . . . . . . . . . 382
129. Encephaloid of the eye . . . . . . . . 386
130. Gelatinoid polype of the ear . . . . . . . 388
131. Goitre . . . . . . . . . . 394
132. Cellular structure of a goitrous thyroid gland . . . . 395
133. Ossified thyroid gland . . . . . . . . 395
134. Œdema of the glottis . . . . . . . . 398
135. False membrane of croup . . . . . . . . 398
136. False membrane of the bronchial tubes . . . . . . 399
137. Ossification of the cartilages of the larynx . . . . 401
138. Polype of the larynx . . . . . . . . 402
139. Uniform dilatation of the bronchiæ . . . . . . 405
140. Sacculated dilatation of the bronchiæ . . . . . . 406
141. Obliteration of the bronchiæ . . . . . . . 407
142. Obliteration of the bronchiæ . . . . . . . 408

FIG. PAGE
143. Microscopic appearances in pneumonia . . . . . . 411
144. Red hepatization of the lung . . . . . . . 412
145. Chronic pneumonitis . . . . . . . . 418
146. Vesicular emphysema . . . . . . . . 420
147. Interlobular emphysema . . . . . . . . 421
148. Pulmonary cavities . . . . . . . . . 430
149. Pulmonary cavities intersected by cord-like bodies . . . 431
150. Cicatrization of tubercular cavities . . . . . . 433
151. Cicatrization of tubercular cavities . . . . . . 434
152. False membrane of the pleura . . . . . . . 445
153. Ossification of the pleura . . . . . . . . 446
154. Pericarditis . . . . . . . . . . 449
155. Cyst in the left ventricle of the heart . . . . . . 458
156. Hypertrophy of the left ventricle . . . . . . . 461
157. Rupture of the heart . . . . . . . . 464
158. Ossification of the mitral valves . . . . . . . 470
159. Fibrinous concretion of the heart . . . . . . . 471
160. Gelatinous polypes . . . . . . . . . 474
161. Nasal polype, containing fibro-cartilaginous concretions . . . 475
162. Epithelial cancer of the lower lip . . . . . . . 478
163. Glossitis . . . . . . . . . . 479
164. Hypertrophy of the tongue . . . . . . . . 480
165. Salivary calculus . . . . . . . . . 484
166. 167. 168. Caries of the teeth . . . . . . . . . 485
169. Chronic inflammation of the dental periosteum . . . . 486
170. Fungous tumor of a tooth . . . . . . . . 486
171. 172. do. do. . . . . . . . . . 487
173. Fusion of teeth . . . . . . . . . 489
174. Malformation of the fangs of a tooth . . . . . . 489
175. Epulis . . . . . . . . . . 491
176. Hypertrophied tonsils . . . . . . . . 493
177. False membrane of the œsophagus . . . . . . . 497
178. Stricture of the œsophagus . . . . . . . . 498
179. Dilatation of the œsophagus . . . . . . . 498
180. Ulcerated scirrhus of the œsophagus . . . . . . 499
181. Ulcer of the stomach . . . . . . . . 524
182. Cauliflower cancer of the stomach . . . . . . . 527
183. Section of a scirrhous stomach . . . . . . . 528
184. Scirrhus of the pylorus . . . . . . . . 529
185. Ulceration of the glands of Peyer . . . . . . . 536
186. Enlargement of the mucous follicles . . . . . . 540
187. Follicular ulceration of the large bowel . . . . . . 541
188. Intussusception of the small bowel . . . . . . 551
189. Sacs of the bowel . . . . . . . . . 554
190. Wound of the bowel; eversion of the mucous membrane . . 555
191. Ligation of the bowel . . . . . . . . 555
192. Cicatrization of the bowel after ligature . . . . . 557
193. Wound of the bowel . . . . . . . . 557

FIG. PAGE
194. Cicatrization of the mucous membrane . . . . . . 557
195. Attachment of the omentum to the bowel, external to the wound . 558
196. }
197. } Cicatrization of the mucous membrane . . . . . . 559
198. Artificial anus . . . . . . . . . 563
199. Diverticulum of the small bowel . . . . . . . 564
200. Ulceration of the large bowel . . . . . . . 565
201. Wart-like vegetations of the mucous membrane of the large bowel . 567
202. Pouches of the rectum . . . . . . . . 573
203. Organic stricture of the rectum . . . . . . . 573
204. Polype of the rectum—external appearance . . . . 574
205. Polype of the rectum—internal appearance . . . . 574
206. External hemorrhoids . . . . . . . . 575
207. Internal hemorrhoids . . . . . . . . 576
208. Minute structure of an internal hemorrhoidal tumor . . . 577
209. Partial prolapse of the rectum . . . . . . . 578
210. Complete prolapse of the rectum . . . . . . . 578
211. Ascaris lumbricoides . . . . . . . . 581
212. Organs of the female ascaris . . . . . . . 581
213. Organs of the male ascaris . . . . . . . . 581
214. Penis of the ascaris lumbricoides . . . . . . . 581
215. Head and mouth of the ascaris . . . . . . . 581
216. Lumbricoid worm in the eye of a button . . . . . . 582
217. Ascaris vermicularis . . . . . . . . 582
218. Trichocephalus dispar . . . . . . . . 583
219. Tænia solium . . . . . . . . . 583
220. Tænia lata . . . . . . . . . . 584
221. False membrane of peritonitis . . . . . . . 585
222. Cartilaginous and osseous concretions of the peritoneum . . . 590
223. Hypertrophy of the omentum . . . . . . . 593
224. Cirrhosis of the liver . . . . . . . . 602
225. Hypertrophy of the hepatic acini . . . . . . . 603
226. Nutmeg appearance of the liver . . . . . . . 603
227. Scirrhus of the liver . . . . . . . . 607
228. Melanosis of the liver . . . . . . . . 609
229. Distoma hepaticum . . . . . . . . . 610
230. Tænia in the liver . . . . . . . . . 611
231. Osseous concretions of the liver . . . . . . . 611
232. Atrophy of the gall-bladder . . . . . . . 615
233. Dilatation of the biliary ducts . . . . . . . 616
234. Calculi in the gall-bladder . . . . . . . . 617
235. Tubercles of the spleen . . . . . . . . 624
236. Granular degeneration of the kidney—incipient . . . . . 640
237. Granular degeneration of the kidney—more advanced . . . 640
238. Granular degeneration of the kidney—still more advanced . . 640
239. Serous cysts of the kidney . . . . . . . 643
240. Cysts of the kidney . . . . . . . . . 644
241. Cysts of the kidney—external appearance . . . . . . 644
242. Cysts of the kidney—internal appearance . . . . . . 645
243. Encephaloid of the kidney . . . . . . . . 646
244. Tubercular excavations of the kidney . . . . . . 647

| FIG. | | PAGE |
|---|---|---|
| 245. | Calculi of the kidney and ureter | 648 |
| 246. | Large strongyle | 649 |
| 247. | Horseshoe kidney | 651 |
| 248. | Dilatation of the ureter and pelvis of the kidney | 651 |
| 249. | Hypertrophy of the muscular fibres of the bladder | 655 |
| 250. | Bar-like formation at the neck of the bladder | 656 |
| 251. | Sac-like pouches of the bladder | 657 |
| 252. | Extrophy of the bladder | 660 |
| 253. | Female dactylius aculeatus | 660 |
| 254. | Male dactylius aculeatus | 660 |
| 255.<br>256. | The same magnified | 661 |
| 257. | Epithelium | 664 |
| 258. | Granular cells from the bladder | 665 |
| 259. | Casts of uriniferous tubes | 665 |
| 260. | Blood-corpuscles in an aggregated state | 666 |
| 261. | Blood-corpuscles in a separate state | 666 |
| 262. | Pus-corpuscles | 666 |
| 263. | Spermatozoa | 667 |
| 264. | Lithic deposit | 670 |
| 265. | Oxalic deposit | 670 |
| 266. | Triple phosphate | 670 |
| 267. | Uric calculus | 673 |
| 268. | Section of the same | 673 |
| 269. | Oxalic calculus | 673 |
| 270. | Section of the same | 673 |
| 271. | Hemp-seed calculus | 674 |
| 272. | Phosphatic calculus | 674 |
| 273. | Ammoniaco-magnesian calculus | 674 |
| 274. | Fusible calculus | 675 |
| 275. | Fusible calculus—internal structure | 675 |
| 276. | Cystic calculus | 675 |
| 277. | Cystic calculus—internal appearance | 675 |
| 278. | Hypertrophy of the prostate | 678 |
| 279. | Lobulated hypertrophy of the prostate | 679 |
| 280. | Hypertrophy of the middle lobe | 679 |
| 281. | Irregular hypertrophy of third lobe | 679 |
| 282. | Prostatic calculus | 682 |
| 283. | Hydrocele of the vaginal coat | 684 |
| 284. | Hæmatocele of the scrotum | 686 |
| 285. | Acute orchitis | 687 |
| 286. | Abscess of the testicle | 687 |
| 287. | Tubercles of the testicle | 689 |
| 288. | Cystic testicle | 690 |
| 289. | Calcareous matter in the testicle | 690 |
| 290. | Fibrous tumor of the vaginal tunic | 691 |
| 291. | Tubercular matter in the seminal vesicles | 694 |
| 292. | Earthy concretions in a seminal vesicle | 695 |
| 293. | Chimney-sweeper's cancer | 295 |
| 294. | Hypertrophy, or elephantiasis of the scrotum | 696 |
| 295. | Stricture of the urethra, with false passage | 700 |

FIG. PAGE
296. Urinary fistules in the perineum . . . . . . . 701
297. Epispadias . . . . . . . . . . 701
298. Venereal ulcer on the penis . . . . . . . 703
299. Warts on the penis . . . . . . . . . 705
300. Phymosis . . . . . . . . . . 706
301. Paraphymosis . . . . . . . . . 706
302. Double uterus . . . . . . . . . 709
303. Bipartite uterus . . . . . . . . . 709
304. Bicorned uterus . . . . . . . . . 709
305. Double cavity of the uterus . . . . . . . 709
306. Retroversion of the uterus . . . . . . . . 710
307. Anteversion of the uterus . . . . . . . . 710
308. Inversion of the uterus . . . . . . . . 711
309. } Enlargement of the mucous follicles . . . . . . 715
310. }
311. Fibrous tumor in the cavity of the uterus . . . . . . 715
312. Fibrous tumors of the uterus—internal and external . . . . 716
313. Fibrous polype of the uterus . . . . . . . 717
314. Uterine polype attached to the base of the organ . . . . . 718
315. Uterine polype hanging from the vulva . . . . . . 718
316. Incipient cancer beginning in the body of the uterus . . . 721
317. Carcinoma of the uterus beginning at the mouth and neck of the organ . 722
318. Laceration of the womb . . . . . . . . 724
319. Hydatids of the uterus . . . . . . . . 726
320. Exterior of a fibrinous mole . . . . . . . 729
321. Mole cut open, showing its structure . . . . . . 729
322. Mole with the cavity communicating externally . . . . . 729
323. Vascular mole . . . . . . . . . 731
324. Ovarian cyst . . . . . . . . . 735
325. Teeth and pieces of jaw-bone . . . . . . . 737
326. Hair from an ovarian tumor . . . . . . . 737
327. Corpus luteum of menstruation . . . . . . . 740
328. Corpus luteum of pregnancy . . . . . . . 740
329. Dropsy of the Fallopian tube . . . . . . . 741
330. Fœtus in Fallopian tube . . . . . . . . 742
331. Enlarged mucous crypts ? . . . . . . . . 743
332. Prolapse of the vagina . . . . . . . . 744
333. Hypertrophy of the clitoris and nymphæ . . . . . . 746
334. Vascular excrescences around female urethra . . . . . 746
335. Adenoid tumor of the mamma . . . . . . . 751
336. Cystic disease of the breast . . . . . . . 753
337. Scirrhus of the breast . . . . . . . . 755
338. Scirrhus of the mamma, showing retraction of the nipple . . . 757
339. Fungus hæmatodes of the mamma . . . . . . . 758
340. Encephaloid of the mammary gland, of the hæmatoid variety . . 758
341. Fibro-cartilaginous degeneration of the placenta . . . . . 760
342. Twisted and knotty umbilical cord . . . . . . 761

# PART I.

# GENERAL PRINCIPLES

OF

# PATHOLOGICAL ANATOMY.

# PATHOLOGICAL ANATOMY.

## CHAPTER I.

### INFLAMMATION.

**Preliminary Observations.—Fluids and Solids.—Different kinds of Sympathy.—Disease, functional and organic.—Inflammation, how modified by Temperament, Age, Sex, Habit, Climate, Season, the nature of the exciting cause, and the character of the tissue; acute and chronic; does not occur with equal frequency in all parts of the body; common and specific.—Nature, symptoms, and seat of ordinary Inflammation; Redness, Heat, Pain, and Swelling; Derangement of the Vital Actions; Structure of the Capillaries; joint agency of the Vascular and Nervous Systems; altered Sensibility; preternatural influx of Blood; Congestion; Theories of Boerhaave, Cullen, Vacca, and others. Terminations and Conditions of Inflammation.**

THE human body is composed of solids and fluids, which are intimately blended together, and mutually dependent upon each other for their origin and preservation. Both classes are resolvable into a number of proximate constituents, differing widely in their color, their consistence, and their chemical properties. Of the fluids, the blood is by far the most important, as it is out of it that the solids are formed, and by it that they are nourished and sustained. The quantity of this liquid, on an average, is about eighteen pounds; but it is liable to vary not only in different persons, but likewise in the same individuals at different periods. Not only its amount, but also its quality, is much influenced by the kind of food and drink, the exercise, the climate, and mode of life, to which the individual is subjected. It is not my design, in this place, to say anything of the chemical constituents of the blood, further than to declare that this fluid contains all the elements of the solid parts of the body, that the latter are constantly permeated by it, and that there can be no secretion, whether healthy or morbid, that is not derived from it. The diseases to which it is liable will be made the subject of separate consideration.

The solids consist of what are called the tissues; of which the number has been variously stated by different writers, scarcely any two agreeing on the subject. Without occupying the attention of the reader with any discussion of this sort, which would be out of place here, I shall merely remark concerning them that they all differ from each other in their appearance, their composition, their structure, and the purposes which they are designed to fulfil in the economy. With the exception of the muscular and nervous fibres, they all seem to be derived from the cellular element, a substance which enters so largely into the composition of the animal machine, cementing together its various parts, and forming myriads of meshes for the reception of its nutrient and recrementitious particles.

Combined in various ways, these tissues constitute the different organs, whether parenchymatous, pulpy, glandular, or erectile. The parenchymatous structure is well exemplified in the lungs, which are composed of a soft, spongy, cellular substance, freely pervaded by vessels. Of the pulpy texture, a good illustration is afforded by the brain: here there is very little cellular matter, and the consistence of the organ appears to depend principally upon the presence of a large proportion of albumen. The glandular structure is still imperfectly understood. The liver, which forms the type of this system, is made up of myriads of rounded or polygonal cells, around which the capillary vessels circulate. The erectile texture, the most perfect example of which occurs in the penis, is composed mainly of arteries and veins, closely interwoven with each other, and susceptible of temporary erection, from the influx of blood.

The tissues, whether they be regarded individually, or as united together to form compound organs, are differently supplied with vessels, nerves, and lymphatics; and, consequently, although they are all important, each in its own way, to the well-being of the general system, some are much more so than others. Whole limbs, containing every variety of texture, may be removed, even in the human subject, without being necessarily followed by the dissolution of the economy; whereas, scarcely a single one of the internal organs, properly so called, with the exception of the spleen, can be extirpated without the destruction of life.

Connected together by vessels and nerves, as well as, in some instances, by continuity of surface, there subsists between the various parts of the body the closest fellow-feeling. In health, this sympathetic action is carried on so imperceptibly as to escape the attention of the physiologist; but no sooner is the system deranged than it manifests itself at almost every point of the compass, serving at once to show the nature of the lesion, and the particular tissue, or set of textures, which it implicates. Every one is familiar with the powerful sympathy existing between the uterus and the stomach; the stomach and the lungs; the lungs and the heart; the heart and the brain. Nor is this fellow-feeling less marked in some of the other viscera. In duodenitis, nothing is more common than to see the liver disturbed in its functions; or, if the disease continue long, even in its structure. The explanation of this is obvious. The duodenum and the liver are not only near neighbors, but the mucous membrane, which lines the former, is extended into the latter, by means of its excretory ducts, into the very centre of each granule. There is thus a direct continuity of structure, in consequence of which disease cannot exist long, or in any considerable degree, in the one without being propagated to the other. So, also, with the urethra and urinary bladder; the vagina and uterus; the fauces and tonsils; the larynx and trachea; the nose and frontal sinuses; the Eustachian tube and middle ear. All these cases are examples of what has been termed continuous sympathy.

In other cases, again, this sympathy displays itself in parts very remote from the one originally affected. In mumps, that is, in inflammation of the parotid gland, a not unfrequent occurrence is a swelling of the testicle, proceeding sometimes to such an extent as to destroy the structure and function of the organ. In what manner, or in accordance with what law of the animal economy, this association is established, it is impossible to say, as there is no similarity of texture any more than a direct nervous connection. The parotid is supplied with filaments from the ascending cervical nerves, and with branches from the fifth cranial; the testicle, with filaments from the spermatic plexus, formed by the sympathetic. Thus, then, there is no immediate tie between these organs, and yet, as has been stated, they often display the strongest fellow-feeling. The sympathy existing between the uterus and the breast, and which is so conspicuous both in the healthy and diseased states of these parts, has been endeavored to be explained by the anastomosis of the internal mammary and epigastric arteries; but it need scarcely be remarked that this mode of accounting for the phenomenon is far-fetched and unsatisfactory, the vessels adverted to having by no means the intimate connection which some have ascribed to them. The same difficulty occurs when we attempt to ascertain the cause of the well-known sympathy between the cerebellum and genital organs. In regard to all of these organs, all that we know is, that there is such a bond of connection, and this, surely, for all practical purposes, is sufficient.

Writers long ago noticed the sympathy between parts of the same structure, situated remotely from each other. In gout, a disease which is seated in the fibrous textures of the extremities, it often happens, especially when the attack is violent, that the pericardium is involved; the affection being transferred from its original situation to the chest. This is effected by what is called metastasis, a term which only expresses our ignorance. The transfer must take place solely on account of the similarity of structure, not through any direct communication; for every anatomist knows that there is no connection whatever between the fibrous envelops of the voluntary muscles and the fibrous covering of the heart. The serous and synovial membranes, the cutaneous and mucous tissues, strongly sympathize with each other, no doubt from the anatomical elements which enter into their composition being so much alike. The liver and the skin are intimately associated by fellow-feeling; but how this is brought about we have no means of determining.

I have thus briefly adverted to the relationship subsisting between the principal organs of the body, and endeavored to account for it upon anatomical principles. Much time might be occupied in the discussion of the subject; but I am not certain that it would result in much good. What is most worth knowing, is soonest learned, and least subject to dispute. The relationship here described should be carefully studied, as it will be impossible, without an extensive acquaintance with it, to comprehend some of the most extraordinary phenomena observable at the bedside of the sick.

Having made these remarks, we may now proceed a step further, and inquire what constitutes disease; for everybody knows what is meant by health. Disease may be defined to be a departure from the sound state, whether this departure consist simply in a derangement of function or structure. So long as the solid and fluid materials of the body act in concert, there cannot, of course, be any lesion; health, in all its vigor and perfection, must be the result: but when the blood and the tissues are arrayed, as it were, against each other, the harmony of the system is interrupted, and unnatural action is set up, or, in other words, there is disease. This deranged action, it need scarcely be stated, may be limited, or it may involve a considerable number of organs and tissues at the same time.

Of the essence of disease, very little is known; indeed, nothing at all; nor can the utmost ingenuity hope to remove the veil which still envelops the subject, until the physiology and pathology of the vascular and nervous systems shall be better understood. The proximate cause of morbid action, and the immediate cause of life in the healthy state, are as inscrutable to the human mind as the cause of gravitation, of attraction, and repulsion. All we can boast of is, that we know something of their effects; beyond this, it is extremely problematical whether we shall ever be able to penetrate. With this, indeed, every philosophical inquirer after truth should be contented, remembering that the secrets of nature are not easily detected, and that to God alone belongs the knowledge of the intrinsic property of things.

It has been already intimated, that diseases are functional or organic. As it is of the latter class that we shall more particularly treat in the following pages, it will be proper that we should speak of them somewhat at length. Before proceeding further, however, it behooves me to explain what I comprehend by the term organic. By pathological anatomists, the word is generally employed to denote some permanent change in the textures of an organ; but, in the present sense, I would not only include under it all such lesions, but also every temporary alteration which the tissues experience when in a state of disease. The term organic will thus have a wider latitude; and, as expressing the same thing, we shall often have occasion to use the word structural. If this acception be adopted, it may perhaps be doubted whether, under any circumstances, there can, strictly speaking, be a functional disease, or, in other terms, a mere aberration of the physiological state of a part, without some change in its anatomical elements. The question, at all events, is not settled.

Bearing in mind the above definition, it may be assumed, as a general proposition, liable to few exceptions, that all organic diseases, whatever be their seat or extent, are the result of inflammatory action, either of an acute or a chronic kind. To some, this proposition may be startling; nevertheless, if it be carefully examined, it will be found, I doubt not, to be grounded on fact. The truth of this remark will appear more evident as we proceed.

The second proposition that may be stated is, that every inflammation, irritation, or morbid action, is originally of a local nature; that is, it always makes its impression in the first instance upon some particular part, texture, or organ. After the malady has continued for a longer or shorter period, it may extend to and implicate other structures. If, for instance, the mucous membrane of the stomach be fretted, the morbid action accruing from this cause will be confined at first to that lining; or, in more comprehensive terms, the disease will be strictly local; by degrees, however, as the disorder progresses, the submucous cellular tissue becomes affected; and spreading still further, it next invades the muscular fibres of the organ, and, finally, the peritoneal covering. It is in this manner that most affections, which are originally local, extend their sphere of action so as to become general, whether they be considered simply in reference to one organ, to several, or to a great number of them.

Inflammation of particular organs and textures is usually designated by adding the Greek term *itis* to the anatomical name of the part affected, as gastritis, laryngitis, pleuritis. In some instances the old nomenclature is retained. Thus inflammation of the tonsils is called quinsy; of the eye, ophthalmia; of the urethra, gonorrhœa; of the parotid gland, mumps.

In regard to its progress, intensity, and mode of termination, inflammation is greatly modified by temperament, age, sex, habit, climate, and season, by the nature of the exciting cause, and, above all, by the character of the tissue in which it is developed. The time of life which seems to be most obnoxious to this disease, is from the first to the tenth year, nearly one half of the entire mortality occurring during this interval. Affections of the cutaneous, mucous, and lymphatic systems, are particularly rife during this period, and carry off an immense number of children. Scarcely less common is inflammation of the arachnoid membrane. Pleuritis, pneumonitis, cerebritis, and hepatitis, with carditis, phlebitis, and arteritis, are comparatively infrequent before the age of manhood; from thence on, however, they are by no means unusual, and prove a fruitful source of destruction. Diseases of the genital organs are rarely observed before the age of puberty; indeed, anterior to this period, these structures seem to lie in a dormant state. Once roused into action, however, they deeply sympathize with the other viscera, and hence the frequency of organic maladies of the uterus, the ovaries, breasts, and testicles, towards the decline of life. Affections of the urinary bladder are comparatively rare in the young, whilst they are very common in the old.

Considered in reference to *sex*, some organs and tissues are more liable to be affected with inflammation than others. Cerebritis and splenitis, as well as carditis and arteritis, are infinitely more common in men than in women, probably, from the organs of the former being more exposed to perturbating agents, both of a physical and a mental kind. On the other hand, it is a well-established fact that the female sex is much more obnoxious to inflammation of the peritoneum, of the veins, and lymphatics, than the male.

The *seasons* of the year in which inflammation is most prevalent are winter and spring; it is also more common in moist than in dry situations, and in cold and hot climates than in such as are temperate. In northern latitudes, the parts most frequently involved are the lungs, the air-passages, and the fibrous textures; in tropical, the mucous membrane of the large bowel, the liver, and the skin.

The above are circumstances in the history of inflammation which, of course, we can only glance at; the subject is one of vast interest to the practitioner, and the attentive study of it cannot fail to be of the greatest benefit to him.

The *rapidity* with which this disease may run its course is subject to a considerable number of circumstances, amongst which the most important are the nature of the exciting cause and the structure of the part affected. As a general rule, it may be stated that the more liberally an organ is supplied with vessels and nerves, the more easily will it be disorganized. Thus, an inflammation of the mucous membrane of the bowels will usually terminate much more rapidly either in health, or in death, than the same disease seated in a fibrous membrane, a tendon, ligament, or bone.

When an acute inflammation, after having existed for some time, does not terminate in the usual manner, it is said to become *chronic*. Paradoxical as it may at first sight appear, there are some varieties of this disease that assume a chronic form at the very moment of their outset. The irritation which accompanies the tubercular deposition, and some species of pure uncomplicated pneumonitis, are of this description.

Considered in regard to its degree of *intensity*, inflammation presents a great variety of forms, from the slightest possible derangement to the most intense morbid action. In this respect, therefore, the disease may be said to be mild, moderate, or violent. For the purpose of designating the first of these conditions, some writers are in the habit of employing the term *sub-acute;* a word which seems to me to be ill-chosen, and consequently conducive to error. The terms mild, slight, or moderate, are free from this objection, and will, therefore, be retained in the following pages.

Inflammation is sometimes *latent*, or, in other words, there is an entire absence of the symptoms by which it is ordinarily characterized. Examples of this variety of morbid action are found in certain forms of pneumonia, arachnitis, and typhoid fever. In the latter affection the glands of Peyer are often very much diseased, and even extensively ulcerated, without any of the usual manifestations of inflammation. Again, inflammation may be *intermittent*, as in certain forms of neuralgia, in chilblain, and, perhaps, in ague.

This disease does not occur with equal *frequency* in all the organs and tissues of the body. There are some parts, in fact, in which it has been doubted whether this affection ever takes place. Such are the nails, the epidermis, and the hairs. These structures are supposed, by general anatomists, to be destitute of vessels, and, therefore, incapable of performing any vital action. This, however, is merely a conjecture; the fact remains to be proved, and, for my own part, I feel quite certain that these textures are susceptible of inflammation, although much less frequently, as well as in a much humbler degree, than the more highly organized tissues.

The cellular, mucous, serous, and dermoid textures are particularly prone to inflammation. It is here that the disease can be studied with the greatest advantage, both as it respects its phenomena and modes of termination, inasmuch as it is usually well-marked, intense in degree, and rapid in its progress. The synovial membranes, the fibrous envelops, the bones, ligaments, and cartilages, with the muscles and their tendons, inflame with difficulty; but when the disease has once fastened itself upon them, they readily yield to its influence, the sufferings being often excessively severe, and the consequences very serious. The blood-vessels, nerves, and absorbents are all more or less liable to phlegmasia. The conservative power of these structures, especially of the former, is remarkable, and is strikingly evinced in cases of gangrene, where, as will be hereafter shown, they frequently retain their vitality amidst the half putrefied mass.

Of the organs, properly so called, some are more ready to take on inflammation than others. Those which are most frequently affected, at least in this country, are the lungs, spleen, liver, uterus, and brain. The heart, ovaries, thyroid body, pancreas, prostate gland, testicles, and kidneys are comparatively rarely the seat of this disease.

Respecting *specific* inflammation, some parts, again, are more prone to this disease than others. Thus, erysipelas commonly attacks the skin; anthrax, the subcutaneous cellular tissue; rheumatism, the fibrous envelops of the extremities; tubercle, the lungs; scirrhus, the glandular organs. In the skin, numerous varieties of inflammation, both of an acute and chronic kind, are observed that never occur in any other of the elementary textures and systems of the body. To this category specially belong the different species of eruptive and scaly diseases, which have their seat, for the most part, in the superficial portion of the dermis, the network of Malpighi, and the cuticle.

*Phenomena and Nature of Inflammation.*—The nature of inflammation, its seat, and the phenomena which characterize it, have always attracted much attention, and been a source of much discussion. Theory after theory has been framed, each in its turn to live for a while, and then to give way to some other, either more ingenious, or fostered and protected with more talent and pertinacity by its author. To review the various notions that exist on this subject would be a task as irksome to the inquirer as it would be unprofitable to the student of pathological anatomy. At every step the mind would be bewildered with idle conjecture, and at the close of the investigation it would be no better off, so far as real and substantial information is concerned, than at the outset. We can only express our regret that so much time has been misspent, so much talent wasted, in the construction of hypotheses, which, although sometimes plausible, do not, in the majority of instances, embrace a single well-ascertained fact to repay us for the trouble of examining them. Pathological anatomy is emphatically a science of observation and induction: in pursuing this inquiry, I shall, therefore, limit my remarks to a simple analysis of what is known respecting it; referring such of my readers as are fond of speculative reasoning to the various works that have been published on the subject within the last two centuries. He will there find a melancholy illustration of the fact that genius, however often it has wandered in quest of truth, has rarely succeeded in detecting it.

The *phenomena* usually enumerated as marking inflammation are discoloration, heat, pain, and swelling. These signs, however, are not always present; nor are they the only circumstances which occur in inflammation in this disease: in every case there is a perversion of the vital actions, attended with an altered state of the nutritive and secretory functions. To affix to these several conditions their respective value, it will be necessary to allot to each of them a considerable share of attention. Most writers, until recently, attached too much importance to some of them, and too little to others; whilst they entirely overlooked the fact that they are always greatly modified by the nature of the tissue in which the malady, of which they are the indices, is located. If we regard the four phenomena, discoloration, heat, pain, and swelling, referred to above, as being essential to the process, it will be at once perceived that there can be but few inflammations; and we shall, therefore, be obliged, in describing diseases, to invoke other names, such as irritation and fever; a blind adherence to which has unfortunately tended too much to retard the progress of pathological science. Boerhaave enumerated one hundred and fifty varieties of fever: had he enumerated a thousand more he would have been much nearer to the truth, for he might then have specified nearly every form of inflammation, whether occurring in the external parts of the body, or in the interior organs. The word "fever" is a conventional one, and is employed to designate, not the nature or seat of a disease, but simply the phenomena which it manifests. So also with the term irritation. Mr. Travers and others have written extensive treatises on this subject; but have they pointed out anything concerning the essential character of this disease? have they told us anything of the peculiar condition of the nervous and vascular systems which accompanies it? So far as I am acquainted with their labors they have not; and yet men continue to talk about irritation, with its numerous varieties, as if they had the most perfect knowledge of its nature, seat, causes, and symptoms. A course such as this cannot but have a most dangerous tendency in practice; for what one physician describes as a fever, another will consider simply as an irritation, a third as an inflammation, and in this way no principles can ever be introduced as standards of treatment. The practice of medicine must continue to ebb and to flow with every tide of professional opinion.

The time, however, cannot be far off, when the term fever must be entirely discarded from our books, and diseases named according to the tissues they implicate. Then, and not till then, can it be expected that the laws of deranged action will be properly interpreted, or fully comprehended. All diseases, I feel confident, will ultimately be found to have "a local origin and habitation;" and if this opinion shall ever be proved to be true, the whole class of febrile maladies, with its hundred varieties and subdivisions, will cease to have a place in our medical treatises. The artificial nosology of Sauvages, of Hoffmann, Cullen, Hosack, and a host of minor worthies, has had its day; its authority is at an end; its sceptre is departed; philosophy has usurped its place, and derides its aid. For the great changes which have been effected, and which are still going forward, in relation to the doctrine of morbid action, we are mainly indebted to a profound cultivation of pathological anatomy, which, since the time of Bichat, a period of less than sixty years, has advanced with such rapid strides, and reduced the healing art to a degree of certainty, which could scarcely have been anticipated.

The *discoloration* of an inflamed part presents various shades, from the slightest rose to the deepest purple. There are some tissues which naturally contain little blood, or which convey only serosity, and these, of course, are never much discolored when affected with disease. The tendons, ligaments, and cartilages are seldom reddened, no matter what may be the intensity of the inflammation. In the fibrous membranes, such as the pericardium, the dura mater, and sclerotic coat of the eye, the discoloration is usually of a lilac or purple hue, with a shade of blue. In the mucous lining of the alimentary tube, the redness, in the early stage of the disease, is bright and florid, like that of arterial blood; but, as it progresses, it often assumes a dark violet, or black appearance, especially when it is about to pass into gangrene. A striking exemplification of the truth of this remark is afforded by the mucous membrane of the fauces in the malignant form of scarlatina. In the beginning of this disease, the tonsils and adjacent parts are of a bright red, which is often, in the course of a few hours, converted into a deep purple. In the skin, the redness is sometimes of a scarlet color; at other times it has a yellow tinge, with various shades of mahogany. The yellow color is most commonly witnessed along with derangement of the liver; hence the frequency of its occurrence in the latter stages of erysipelas and anthrax. In inflammation of the pleura and peritoneum, the redness is, at first, of a lilac hue; afterwards of a scarlet, brownish, or violet. In the arachnoid there is rarely, if ever, any perceptible discoloration.

Inflammation of the spleen and liver is attended with a purple hue: when the brain is affected, the color is generally rosaceous, cineritious, or like the lees of wine. The salivary glands are usually of a pink complexion; the kidneys, of a deep violet; the testicles and ovaries, of a reddish yellow. In the lungs the color varies from the slightest rose to the deepest purple.

The redness is generally greatest at the centre of the inflamed part, from which it gradually diminishes in intensity until it reaches the natural standard of the tissue or organ in which it is located. It may be superficial or deep-seated; circumscribed or diffuse; arborescent or capilliform; punctated or blotch-like. In some instances, as in the lining membrane of the arteries, the color is uniform, having the appearance as if it were dyed into the part. Whatever form it may assume, the immediate cause of it is an unnatural influx of blood into the capillaries, the red globules being admitted in much greater numbers than in the sound state. So long as the circulation in these vessels is carried on vigorously, the redness in many of the tissues will be of a bright scarlet tint; but no sooner does the blood begin to stagnate than the part assumes a darker hue, probably from some chemical change which the fluid experiences under such circumstances.

When a part is inflamed, is there really a preternatural development of *heat?* Mr. John Hunter thought there was not; and, in corroboration of this opinion, he adduces some experiments which he performed on the inferior animals. He made a wound in the right side of the chest of a dog, and, pushing the thermometer in contact with the diaphragm, ascertained that the temperature of the part was 101°. A large dossil of lint was then put into the opening, and its surface covered over with adhesive strips. On the following day, when the parts were in a state of inflammation, the foreign substance was removed, and the instrument being again introduced, the heat was found to be exactly the same as before, namely, 101°. Similar experiments were made on the rectum and vagina of an ass, with the same results. There would thus seem to be no real increase of temperature. As a general rule, this is no doubt the case. Nevertheless, it has been clearly ascertained that, under certain circumstances, the reverse obtains.

The difference is certainly not so great in the external as in the internal parts of the body. Yet even here there is reason to believe that the temperature of the inflamed structure is frequently higher, by several degrees, than that of the blood. In the natural state, the average heat of this fluid, as I have ascertained by numerous experiments, is 96°, whereas, in disease, the thermometer sometimes falls as low as 92°, or rises as high as 104°.[1]

Every one knows how extremely hot the breath is in inflammatory affections of the throat, which can only be explained on the assumption that there is a partial increase of temperature. That the heat of the body, like every other physical endowment, is liable to be modified, is a fact which has been clearly established by the researches of physiologists. Sir Everard Home states that the oviduct of a frog ready to spawn, is two degrees hotter than the heart; and it has been ascertained by Professor Dunglison,[2] that, during labor, the temperature of the uterus sometimes rises to 106°. A similar phenomenon has been observed to occur in plants. M. Huber[3] found that, when the heat of the atmosphere stood at 21° of the centigrade thermometer, the instrument surrounded with spadices of the arum cordifolium, during the process of fecundation, rose as high as 42°.

From the foregoing facts, it clearly appears that there is occasionally a considerable extrication of heat, even when there is no inflammation, or when there is merely a slight approximation towards it. The subject of animal heat is still enveloped in doubt: that it is dependent, however, in great measure, upon the nervous system, appears sufficiently obvious; and if this point be conceded, no difficulty will be in the way of accounting for the alterations of temperature which occur in different conditions of the body. A deranged state of the nervous function would, of course, be accompanied by a corresponding modification of the heat of the part, whether this was higher or lower than the natural standard; and this, indeed, is precisely what happens when inflammation is seated in parts remote from the central organ of the circulation. In cases of erysipelas, furuncle, and anthrax, the thermometer has been observed, in numerous experiments made since the time of Mr. Hunter, to rise as high even as 107°. Similar results have been noticed in tetanus and acute rheumatism. The temperature of a scrofulous tumor has been found raised as much as 5½° above the general heat of the body. There can, therefore, be no doubt whatever, as was before intimated, that, in certain cases of inflammation, whether occurring in the interior organs or in the external parts, there is a real augmentation of temperature, over and above what is observed at the heart, the great fountain of the circulation. In some parts of the body, such as the ligaments, bones, cartilages, fibrous membranes, and tendons, the extrication of heat must necessarily be very slight.

---

[1] See The Western Medical Gazette, vol. i.

[2] American Med. Intelligencer, Feb., 1839.

[3] Ellis on Respiration, p. 204; also, Mayo's Physiology, p. 79, 4th ed.

*Pain* is one of the most important symptoms of inflammation. Like redness, it varies in degree according to the nature of the affected part. As a general rule, it may be stated, that it is most keenly felt in those structures which are most liberally endowed with vessels and nerves. There are some tissues which, in the healthy state, are perfectly void of sensation, but which are exquisitely sensitive when laboring under disease. Thus, for example, a sound bone may be sawed, rasped, and even burnt, without the animal evincing the least uneasiness; but no sooner does it become inflamed than it gives rise to the most excruciating torture, leading often rapidly to hectic, with its whole train of evils. Similar phenomena occur in the fibrous membranes, the tendons, ligaments, and cartilages. In regard to the different viscera, it is a singular fact that they generally experience much more pain when their coverings are affected than when their proper structure is involved. In hepatitis, the inflammation often proceeds to a most destructive extent before the individual is aware of his danger. Cerebritis is seldom so painful a malady as arachnitis; and a pleuritis, it is well known, is invariably attended with more suffering than a pneumonitis.

The degree of suffering evinced by the mucous membranes, in a state of inflammation, is subject to much variety. In some situations the pain is excessive, whilst in others it is literally absent, the disease proceeding in its work of disorganization without giving the individual, so to speak, the slightest intimation of it. In pulmonary phthisis, nothing is more common than to find ulcers in the ileum and colon, sometimes of great size, where there was no sign whatever of their presence during life. It is a singular fact, in relation to this subject, that the pain is usually much greater when the inflammation is seated at the extremities of the mucous membranes, or at their junction with the skin, than when it involves the intermediate points. The difference may be explained by the difference of organization. The mucous lining of the intestinal tube, and of the air-passages, which often manifests very little sensibility when inflamed, receives its nerves almost entirely from the ganglionic system; whereas the reverse is the case with the conjunctiva, the fauces, the urethra, and urinary bladder, the vagina and rectum, these parts being liberally supplied by filaments derived from the cerebro-spinal axis.

The pain varies not only in degree, but also in its character. In the cellular tissue it is acute and pulsatile; in the pleura, sharp and lancinating; in the lungs and glandular viscera, obtuse and heavy; in the skin, prurient and smarting; in the bones, dull and gnawing. Sometimes the pain is persistent, sometimes intermittent, sometimes periodical; but, what is more remarkable than all is, that it is not unfrequently felt at parts very remote from the one originally and mainly affected. We have a familiar instance of this peculiarity in the hip-joint disease of children, in which the earliest symptom complained of is pain in the knee. In hepatitis, the right shoulder is often the seat of the suffering; in cystitis, the head of the penis. We are sometimes enabled to account for this by the direct nervous communication, but more frequently the matter is entirely inexplicable. When inflammation is about to pass into suppuration, the pain usually becomes throbbing, and the patient is seized with shivering, with fever, and, in some instances, with delirium. After this process is fairly established, it almost always diminishes in intensity, or even wholly subsides. Pressure generally increases the pain, and in some cases the slightest touch of the finger produces intolerable suffering.

The proximate cause of this symptom has been variously accounted for. It is usually supposed to be owing to the unnatural influx of blood, the increased size of the capillaries, and to the quantity of effused fluids, which compress, it is said, the delicate nervous filaments of the part concerned. This seems to me, however, to be taking only a partial view of the case. To complete the theory, it is necessary to assume that the nervous filaments themselves are affected, altered, or deranged, independently of the causes just adverted to; and in this idea there is nothing in the least repugnant to the laws of pathology. What the precise nature of the change is we cannot define; nor is this a matter of much importance.

The effect of augmented circulation in producing augmented sensibility, is strikingly evinced in what occurs in inflammation of the hand. If the part be allowed to hang down, severe throbbing pain is instantly felt, which is as instantly relieved, in many cases, by putting the limb in an elevated position. Cold applications, by constringing the vessels, lead to the same result, and hence their beneficial effect in the treatment of external inflammation.

The fourth and last symptom of inflammation, to be noticed, is *swelling*. This is occasioned partly by the enlargement of the vessels, but chiefly by the effusion of serosity, lymph, blood, or pus, into the cellular tissue. In its degree it varies according to the laxity and vascularity of the part concerned. It is always well marked in the subcutaneous cellular substance, whilst the skin itself is generally little, if at all, affected by it. Inflammation of the serous and fibrous textures, the ligaments, tendons, muscles, cartilages, and bones, is usually unattended with swelling. The same remark is applicable to the internal viscera. The mucous membranes are rarely the seat of tumefaction, this symptom being noticed chiefly in the vulva, at the mouth of the larynx, and in the conjunctiva of the eye.

Although the swelling generally comes on gradually, yet, in some instances, it proceeds with astonishing rapidity, at the same time that it spreads over a large extent of surface. The sting of the bee, wasp, hornet, and yellow-jacket, and the bite of the rattlesnake are often attended with the most frightful tumefaction, which makes its appearance sometimes in a few minutes, and speedily diffuses itself over an entire limb, or even the whole body.

From the hasty survey which has been taken of these symptoms, we are authorized to conclude that they are by no means entitled to the stress which has been generally placed upon them by writers. In many instances there is an entire absence of at least one or two of them, and yet the part is absolutely in a state of high inflammation. How often does it happen that enteritis is lighted up, and goes on to destructive disorganization, without even the slightest indication of its presence? In arachnitis, the only symptom, frequently, is severe cephalalgia, with delirium and partial paralysis. The patient dies, and, on examination, the membrane is found to retain its natural thinness, and to be as free from injection as in the sound state. In such a case, should there be but little effusion of serum and fibrin, a superficial observer might conclude that there had not been any inflammation, or that what he saw was the result solely of irritation. The injurious tendency which such a mode of procedure would exert on the practice of medicine is too obvious to require any comment in this place. In reasoning on this subject, the physician should constantly bear in mind the important fact, that the symptoms which have been enumerated above, although they are frequently all present, are not necessarily so, and that the absence of some of them is not a sufficient proof that inflammation does not exist. By such course alone can he expect to escape error.

Besides these phenomena, there is always, in well-established inflammation, a perverted state of the vital action. In none of the tissues is this state, perhaps, ever entirely absent; and yet, as might be expected, it is much more conspicuous in some than in others. It is sometimes, indeed, the only symptom present, or the only one which can be recognized. In gastritis, the only manifestation of which is frequently irritability, without heat or pain, or uneasiness on pressure, the digestive function is entirely suspended, gastric juice is no longer secreted, and the organ is oppressed by the mildest articles of food. In the duodenum the process of chylification is interrupted, retarded, or perverted; in the liver, bile is either no longer deposited, or it is furnished in small quantity, and vitiated in quality. In high degrees of inflammation of both kidneys, there is sometimes a total want of urine, and the individual dies under all the symptoms which characterize the retention of that fluid in the bladder. It should be observed here, that, as a general rule, this derangement of the functional action is always greatest when the irritation is at its height, and that, from this period on, it gradually diminishes until the disease subsides.

When the office of an organ is to receive some external impression, it does either not so at all, or only very imperfectly. The inflamed eye is no longer able to take cognizance of light; the Schneiderian membrane does not notice odors; and the ear is incapable of distinguishing sounds. When the brain is affected, the intellectual faculties are deranged, and the individual raves with delirium, or lies, like an automatic mass, dead to all surrounding impressions.

The function of *absorption* is often very much impaired in this disease. A solution of strychnine applied to an inflamed serous membrane, as the pleura, will not result in any injury to the animal, or only in a very long time after the contact has been effected. In some experiments made by Gendrin, prussic acid was applied with impunity to the conjunctiva of the eye, the Schneiderian membrane of the nose, and the mucous lining of the vagina, which had been previously inflamed by hot oil and tincture of cantharides. Notwithstanding, however, the results of these experiments, correctly stated, no doubt, by the French philosopher, experience daily teaches us that, whilst some substances are rejected by the organs and tissues, when in a high state of inflammation, there are others, the absorption of which is still, to a certain extent, carried on. In the stomach, for example, mild diluent drinks, such as gum-water, flaxseed tea, or arrowroot, are rapidly conveyed into the circulation, and are usually more or less employed by practitioners. If the quantity given, however, be so great as to oppress the affected organ, absorption will cease, and the fluid will be ejected. In the serous cavities nearly the same circumstance is observed. When the fluid that is effused in these situations exceeds several quarts, the absorbents appear to be incapable of taking it up, and the surgeon is obliged to evacuate it. Acetate of morphia applied to a piece of skin that has been inflamed by a blister, will tranquillize the system nearly in as short a period as when it is introduced in the ordinary way.

Not less remarkably altered is the nutritive function. If an organ remain for a considerable time inflamed, the particles which are requisite for its growth and nourishment are withheld, and, in consequence, it gradually sinks into a state of atrophy. In more rapid cases, the part retains its natural bulk, but undergoes a change of color and consistence, from the imperfect admission of blood, and from some derangement of the molecular structure. This state is remarkably conspicuous in several of our organs and tissues, and will be described hereafter under the name of softening, mollescence, or ramollissement.

The next subject which we have proposed to discuss is the *seat* of inflammation. That this is in the capillary vessels is a fact concerning which there exists no dispute. Of the nature of these vessels themselves, however, different views have been expressed by anatomists, and it will, therefore, be necessary, before proceeding farther, to examine briefly their situation, structure, and functions; for in this way alone can we expect to throw any real light upon the nature of the present disease.

The capillaries are those minute tubes which are everywhere interposed between the arteries and the veins. It was at one time imagined that they formed a distinct set of vessels by themselves, perfectly independent of the rest of the vascular system, an opinion which has been abundantly disproved by the researches of modern anatomists. It is now well known that they not only communicate directly with the arteries and veins, but likewise that they are, as it were, merely so many prolongations of them.

The walls of the capillaries, as may be imagined, must be extremely thin, delicate, and transparent, otherwise it would be much easier to discern them. Bichat states that they are formed entirely out of the inner arterial and venous membrane, the other tunics being excluded, as he alleges, from their composition. An opinion precisely similar to this is advanced by Beclard. He asserts that the parietes of the capillaries are scarcely to be distinguished from the substance of the organs in which they are situated, and thence draws the inference that they are rather formed out of this substance than that they possess walls of their own, acknowledging, however, at the same time, that it is not impossible that the internal tunic of these vessels is uninterruptedly continued from the arteries to the veins. More recent investigations, by means of minute injections, and of powerful microscopes, have satisfactorily demonstrated that the capillaries are not mere channels in organs, but are, indeed, possessed of parietes, consisting of an exceedingly fine structureless membrane, in which here and there elongated nuclei are imbedded, and which is continuous with the fibrous portion of the internal tunic of the larger vessels. Where, however, the arterial capillaries terminate or the venous begin, is for the most part still a matter of conjecture.

With regard to their caliber, the capillaries are divisible into two classes. The one embraces those minute tubules which, though invisible to the naked eye, are found, when examined with the microscope, to be capable of carrying a continuous stream of blood, so as to give the part in which they are located a red appearance; the other includes those delicate vessels, the cavity of which is so small as to admit only a single globule at a time, and which it is extremely difficult to detect even with a good magnifier. By reflecting for a moment on the size of the red particles of the blood, estimated by most writers to be about the three thousandth part of an inch, the reader will be struck with the great tenuity of these vessels.

That the capillaries do not abound equally in all the organs and tissues, was rendered sufficiently obvious in speaking of the phenomena of inflammation. The parts which form the basis of the skeleton, together with the tendons, the cellular substance, the epidermis, nails, and hairs, have, comparatively, few of these vessels after the body has attained a certain degree of development. In the early stages of life, however, several of these structures are highly vascular, and can be readily injected. The serous membranes appear to possess very few capillaries; in the healthy state, in fact, none can be discerned in them; yet, when inflamed, they are rendered highly vascular, and thousands of minute vessels, which before were invisible, are now perfectly distinct, giving the affected part a beautiful reddish aspect. The capillaries abound in the mucous membranes, the skin, the liver, spleen, lungs, and kidneys. They are also very numerous in the heart, the muscles of voluntary life, in the brain, and in the pia mater.

Thus situated, and thus constituted, the capillaries form by far the most interesting as well as the most voluminous portion of the vascular system. To it are confided the important functions of nutrition, secretion, calorification, and, perhaps, also, at least in part, that of absorption. Whilst the larger vessels perform the office merely of sangui-ducts, it is in the capillaries that the fluid and solid materials are brought into those intimate relations which precede the conversion of the one into the other, and which are necessary to their vitality and support. In inflammation the capillaries play a most important part; blood is sent into them in unnatural quantity; their action is perverted, and, in consequence, various fluids are poured out which are foreign to the normal condition of the economy. These, however, are not the only structures that are affected. It is highly probable that the nervous filaments are equally engaged in the morbid enterprise, though this is a point concerning which our information is extremely slender. The fact is certain that neither of these tissues can be long involved without the other participating in the derangement.

The joint agency of the nervous and vascular systems, in the production of inflammation, has been happily illustrated by the researches of modern physiologists. It has been ascertained, for example, that, when the ophthalmic branch of the fifth pair of nerves is divided in the cranial cavity of a rabbit at the Varolian bridge, inflammation is speedily lighted up in the surface of the eye, which eventuates in opacity of the upper segment of the cornea. What is still more remarkable is, that, when the nerve is cut on the petrous portion of the temporal bone, so as to involve the destruction of the ganglion of Gasser, the resulting irritation is not only more violent in degree, but much more deeply seated, as well as more deplorable in its effects, the consequence being nothing less than a complete disorganization of the organ.

Analogous effects follow the division of the pneumogastric nerves. When these cords are cut high up in the neck, the lining membrane of the air-passage assumes a dark color, the lungs are engorged with black blood, and an abundance of serosity is poured out into the parenchymatous texture, as well as into the pulmonary vesicles and the minute branches of the bronchiæ. The pleura generally participates in the irritation, and there is almost always more or less inflammation of the stomach, with a suspension of the secretion of the gastric juice.

Animals in which the brachial plexus of nerves has been tied are seized, in a short time, with inflammation of the integuments of the remote parts of the limb, which gradually progresses until all the soft structures are invaded by gangrene. A friend of mine removed a section of the peroneal nerve on account of a neuroma; the wound was long in healing, and two of the small toes sloughed before the patient recovered. These facts enable us to explain certain circumstances that have been long noticed by practitioners in particular morbid states of the system. A part affected with palsy is much less capable of withstanding the ordinary impressions of physical agents, than one receiving its customary supply of nervous influence. A burn in a paralytic person creates much more serious mischief than in one that enjoys perfect health; and the same is true in regard to blisters and other irritants, the injudicious application of which often leads to the destruction of large portions of the skin and subjacent cellular tissue. There is little doubt that the inflammation of the bladder, which always supervenes upon serious injury of the spinal marrow, is caused in the same way; that is, by the interruption of the natural supply of the nervous influence.

In whatever manner parts are deprived of their nervous influence, it is presumable that they are brought under relations somewhat analogous to those of a frozen limb. The temperature is lowered, the sensibility impaired, the process of nutrition perverted; in a word, the natural connection between the vessels and nerves is broken up, and hence that series of phenomena known under the name of inflammation. Let us pursue this subject a little further.

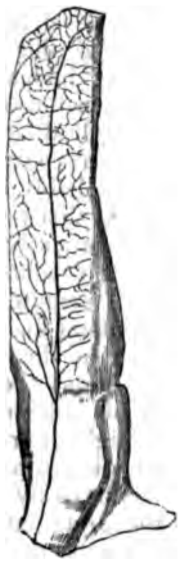
The very first step in the process of inflammation is an altered sensibility of the part, produced by some hurtful agent, which the system makes an effort to dislodge. To effect this, the local impression is reflected upon the cerebro-spinal axis, and through this again upon the heart, which, being sympathetically incited to increased action, sends more blood to the part concerned than it is accustomed to receive, at the same time that the capillaries are perceptibly dilated. Those who maintain that the capillaries possess an inherent contractility, by virtue of which they aid in the circulation, may probably be disposed to deny the agency of the heart in bringing about this preternatural determination of blood; but if they will only carefully study the subject, they will, I am sure, arrive at a different conclusion. That these vessels do contract and dilate, no one will dispute; for experiment has fully decided this point; all that I contend for is, that the capillaries have no vermicular movement, and that they are, therefore, incapable of carrying on the circulation without the direct influence of the heart. In the inceptive stage of inflammation, this sympathetic action of the heart is no doubt so slight as frequently to escape the attention of the observer; but, as the disease progresses, it assumes a more distinct character, and can always be easily recognized.

The phenomena above alluded to, namely, the preternatural influx of blood, and the dilatation of the capillaries, can be easily detected by exciting irritation in the mesentery of a rabbit, the tail of a tadpole, the fin of a fish, or the web of a frog's foot, parts which are perfectly transparent, and therefore well calculated for the purpose. On viewing these structures with a microscope, in the sound state, numerous channels will be observed filled with blood, the red globules of which roll along in the most regular and beautiful order. If they be now irritated with spirits of wine, hot water, or diluted acid, the little rivulets will be found to become dilated, from the manner in which the blood is crowded into them by the heart, which, in order to remove the local obstruction, is excited into sympathetic action.

In a few minutes hundreds of vessels, which were previously invisible, will be seen shooting out in different directions, and connecting themselves with the sides of those that appeared in the first instance. These are not new channels, but old ones appertaining to the second class of capillaries, which are rendered evident by the intromission of red particles, which are either excluded in the healthy state, or pass along in so slow and gradual a manner as to elude the eye of the beholder.

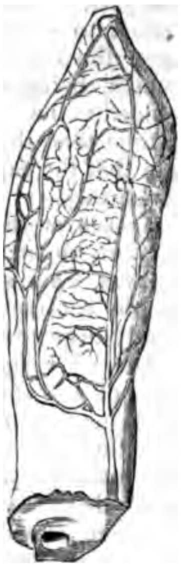
The dilated condition of the vessels is well seen in the accompanying cuts from Hunter. They represent the two ears of a rabbit, one in the natural state, the other inflamed, from having been frozen and thawed. They were injected at the same time, and consequently with the same degree of force. Fig. 1 is the natural ear; Fig. 2 the inflamed ear. The vessels in the latter are not only much larger than in the former, but also apparently more numerous; the main artery in the one is likewise greatly increased in size, while in the other it is hardly distinguishable.

Fig. 1.



Natural ear of a rabbit.

Fig. 2.



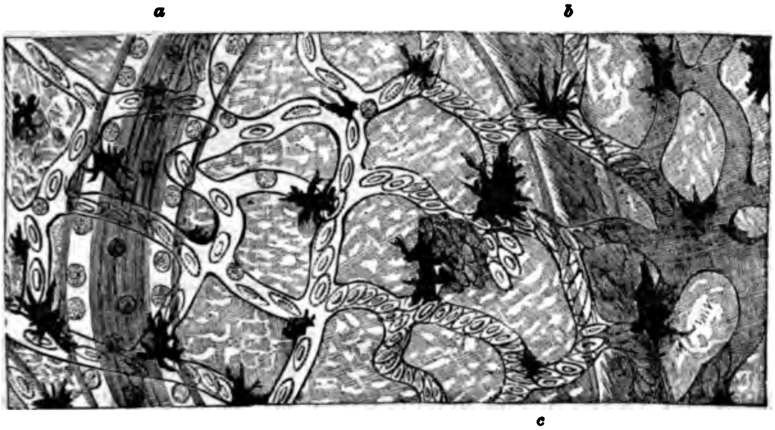
Inflamed ear of a rabbit.

Such are the initial steps of inflammation. If the process be now checked by the removal of the exciting cause, the phenomena referred to gradually disappear, and the part recovers its natural tone and condition.

If, on the other hand, the inflammation be allowed to proceed, another series of changes may be witnessed surpassing, if possible, in point of interest, those just described. The circulation gradually ceases, and a perfect state of stagnation occurs in the inflamed part.

The capillaries become filled with red corpuscles, which adhere to the walls of the vessels, and subsequently constitute a dense uniform mass of thickened blood of a bright or sometimes dark red color, opposing an effectual barrier to artificial injection. With these alterations the healthy functions of the part are suspended. It is red, hot, painful and tumid; and serum, lymph, or pus, may fill its interstices.

Fig. 3.



An exact copy of a portion of the web in the foot of a young frog, after a drop of strong alcohol had been placed upon it. The view exhibits a deep-seated artery and vein, somewhat out of focus; the intermediate or capillary plexus running over them, and pigment cells of various sizes scattered over the whole. On the left of the figure, the circulation is still active and natural. About the middle it is more slow, the column of blood is oscillating, and the corpuscles crowded together. On the right, congestion, followed by exudation, has taken place, constituting inflammatary action in the part.

*a.* A deep-seated vein, partially out of focus. The current of blood is of a deeper color, and not so rapid as that in the artery. It is running in the opposite direction. The lymph space on each side, filled with slightly yellowish blood plasma, is very apparent, containing a number of colorless corpuscles, clinging to or slowly moving along the sides of the vessel.

*b.* A deep-seated artery, out of focus, the rapid current of blood allowing nothing to be perceived but a reddish-yellow broad streak, with lighter spaces at the sides.

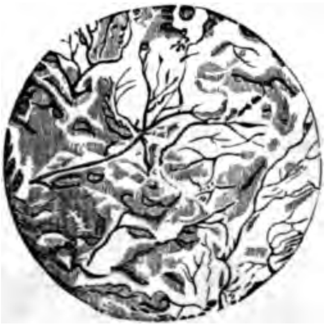
Opposite *c*, laceration of a capillary vessel has produced an extravasation of blood, which resembled a brownish-red spot.

At *d*, congestion has occurred, and the blood corpuscles are apparently merged into one semi-transparent, reddish mass, entirely filling the vessels. The spaces of the web, between the capillaries, are rendered thicker and less transparent, partly by the action of the alcohol, partly by the exudation. This latter entirely fills up the spaces, or only coats the vessel.—BENNETT.

In violent cases the blood breaks through the diseased vessels, and forms slight ecchymoses, as in Fig. 4, from Hunter, representing a magnified portion of inflamed serous membrane. The same appearances are seen in the inflamed web of the frog, in Fig. 5, from Marshall Hall. Occasionally, again, the blood escapes from the vessels, and, forcing its way along the cellular tissue, forms new channels, through which it afterwards continues to circulate.

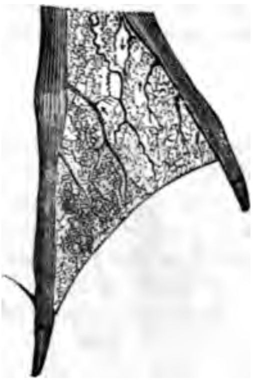
Immediately around the seat of greatest intensity of the morbid action, the vessels are distended and the blood circulates but slowly through them. At a more remote point, phenomena somewhat different may be witnessed. An active determination towards the inflamed part fills the vessels; but the blood moves in continuous streams and with extreme rapidity; and unable to traverse the stagnated masses, is sent onwards through new channels: so that, whilst in the centre of the morbid action, stagnation occurs, and around this a sluggish circulation exists, in the neighborhood of the lesion an increased activity is the result. The arteries that lead to the part are distended and pulsate strongly; but not, as has been asserted, with preternatural frequency.

Fig. 4.



Inflamed serous membrane.

Fig. 5.



Inflamed web of a frog's foot.

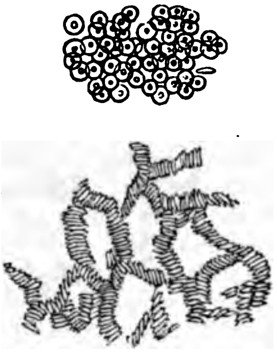
A circumstance that has been recently much dwelt upon is the appearance of the blood in inflammation. If a drop of this fluid from an inflamed part be examined with the microscope, the red corpuscles may be observed to run almost immediately into clusters of piles or rouleaux, as represented in Fig. 6. The same appearance is observed in the blood of pregnant women; it does not occur, however, within the walls of the vessels, but only in the blood when coagulating. Many authors regard an increase of the white corpuscles as a constant phenomenon in the blood of an inflamed part; but this fact may still be regarded as undecided.

Inflammation, it will thus be seen, is a gradual process, which is preceded and accompanied by certain stages, running insensibly into each other. Contrary to what might be inferred from analogy, it has been ascertained that more time is usually required for this process to be developed in highly vascular organs, as the lungs and peritoneum, than in parts in which the circulation is more tardy and less perfect, as the liver and kidney. It is worthy of remark, however, that when the disease is once fairly established, it progresses much more rapidly in the former than in the latter of these structures.

Having thus finished the notice which it was proposed to take of the anatomical characters of inflammation, it will only be necessary, in concluding this part of the subject, to allude to the principal circumstances which are capable of producing congestion and discoloration of the different organs and tissues, immediately prior to, during, or subsequently to, the extinction of life. In a practical point of view, not less than in a pathological, this is a matter of no trifling moment, yet one concerning which there still prevails a great deal of misapprehension in the minds of medical men.

*Congestion and Discoloration.*—The causes under the influence of which congestion and discoloration may be produced before death, are referable, first, to mechanical obstruction, interfering with the free return of the venous blood; and, secondly, to the effects of stimulating agents, introduced into the body either as food, drink, medicine, or poison. The latter of these will be examined in another place, and it will therefore only be necessary, on the present occasion, briefly to inquire into the character of the former.

Fig. 6.



Microscopic diagram showing the reticulated arrangement of the corpuscles in inflammatory blood. In the upper part, normal ordinary aggregation is shown in contrast.—WHARTON JONES. Edinburgh Medical and Surgical Journal, October, 1843, p. 309.

Whatever has a tendency to interrupt the passage of the blood to or from the heart, must be a cause of congestion in the organ where the accumulation takes place. The obstruction, which may exist in any part of the body, may be produced by a great variety of circumstances, as the presence of a tumor, some morbid deposit, or the obliteration of a large vessel. But the more common source of it, perhaps, is organic lesion of the heart, particularly of its valves, of the auriculo-ventricular apertures, or of the mouth of the aorta or pulmonary artery, opposing the progress of the blood, and throwing it back upon other viscera, which thus receive an undue supply of it. That congestion may be, and often is, produced in this manner, is too well known to admit of dispute; but it is by no means so clear that it does not, inasmuch as it is of a permanent nature, give rise to results very different from those we are now contemplating,—in a word, that it does not lead to inflammation, or to what Andral has termed active hyperæmia. However this may be, it seems to me that pure, uncomplicated congestion, in whatever parts of the body occurring, must uniformly depend upon one or other of the following circumstances: 1. Obstruction of the heart and great vessels, by the formation of fibrinous concretions during the last struggles of life. 2. Partial paralysis of the heart, disqualifying it, to a greater or less extent, for carrying on the circulation. 3. Asphyxia, whether induced by actual strangulation, the inhalation of deleterious gases, or difficult dissolution in ordinary sickness.

The congestion produced by the first two classes of causes is generally partial, and is almost always limited to the more dependent situations; that, on the contrary, which results from asphyxia usually pervades the whole body, and is particularly conspicuous in the skin, the conjunctiva, the mouth and lips, in the lungs, the heart, and the great vessels, which are often distended, to their very utmost, with black fluid blood. In either case, the resultant discoloration is of a dull bluish tint, as well as much more uniform than in inflammation.

The causes which operate in the production of congestion and discoloration after death, are the gravitation of the blood, and the transudation of this fluid, or of some of its component elements, through the parietes of the vessels.

It is well ascertained that, with the cessation of life, the blood, in obedience to the laws of gravity, gradually subsides to the more depending structures, distending their vessels, both large and small, and imparting to them its peculiar color. Under ordinary circumstances, these appearances are most conspicuous in the posterior parts of the body; but observation has fully shown that they may be produced in any situation, laterally, in front, or behind, simply by placing the subject in a particular position, and keeping it there until it is deprived of its warmth. The congestion thus arising is limited, in great degree, to the veins, which are often as thoroughly distended as if they had been filled with injecting matter; they spread out in an arborescent manner, and are generally traceable to large trunks, which are themselves frequently quite full of blood. Their contents are of a dark modena color, perfectly fluid, or partly fluid, and partly coagulated, and easily pressed from one place to another; the reverse of which, as before stated, is the case when the congestion depends upon inflammation. At what period the injection begins has not been accurately determined; there is reason, however, to believe that it frequently commences several hours, or even days, prior to dissolution. In the generality of instances, as is well known, the approaches of death are gradual; one organ fails, as it were, after another, and whilst some parts are still actively engaged in the discharge of the duties which nature has assigned to them, others have either ceased to act, or have become so crippled as to be able to perform their functions only in a tardy and imperfect manner. Under such circumstances, observation warrants the presumption that the blood, from the feeble impulse exerted upon it by the heart, the central organ of the circulation, accumulates in the more dependent parts of the body, in a mode calculated to produce local congestion, with a corresponding augmentation of color, long before the solids and fluids are consigned to the influence of decomposing agents.

The structures which are more particularly liable to be affected by this kind of injection, are the posterior portions of the lungs, of the liver, and of the kidneys, for the reason not only that these organs are highly vascular in the normal state, but that the individual usually lies upon his back, both after, and for some time previously to, death. For the same reason, the skin of the back parts of the neck, trunk, and extremities is always much more loaded with blood than at the sides or in front, where the cutaneous vessels are comparatively empty. The accompanying discoloration varies with the nature of the affected tissues, from slight rose to deep red, as in the most intense inflammation. Ordinarily, however, it is very faint, as well as more uniform and diffuse than in disease, and much more easily removed by pressure and ablution.

The second cause capable of imparting an abnormal color to the animal textures after death, is the transudation of the blood through the parietes of the vessels. It is a law of the healthy economy that the vessels shall retain the fluid which is destined to pass along them without suffering permeation; but no sooner is the vital principle withdrawn than the body is brought under the influence of surrounding agents, which speedily change the relations of its various component elements, and impress upon them a total alteration of character. Amongst these, the most important, in connection with the present topic, is the percolation of the blood through its vessels, and its diffusion through the solids, by which the latter are rendered unnaturally red and moist, as if they had been steeped in some coloring liquid. The redness thus produced, as it almost always depends upon putrefactive decomposition, rarely appears within the first four-and-twenty hours after death, unless there is a very high degree of summer heat conjoined with atmospheric humidity. Nor does it occur with equal facility or frequency in all parts of the body; the structures which are soonest and most extensively affected are the endocardiac lining and the internal tunic of the arteries and veins, where it is often mistaken for that of inflammation. To this, however, it bears only a very remote resemblance. It is usually a mere scarlet stain, as if it were attached to the free surface of the membrane, over which it is generally uniformly diffused, without any particular alteration in the subjacent parts, or any deposit upon the interior of the tube. Sometimes the redness occurs in bands, patches, streaks, points, or arborescent lines, with intervals retaining the ordinary appearance. The latter variety is frequently observed along the course of the larger veins of the stomach and bowels, in warm, wet weather, when the examination is delayed beyond thirty-six hours. Similar phenomena are occasionally witnessed, under like circumstances, in the skin of the back part of the body, particularly in those regions which are subjected to pressure. Finally, as the process of decomposition advances, the discoloration, losing its scarlet character, assumes a muddy, brownish aspect, with various tints of green, and, at the same time, pervades, to a greater or less extent, all the softer textures of the body. These changes take place, all other things being equal, much sooner in warm than in cold weather, and in full, plethoric individuals, than in such as die in a state of general anaemia.

Exposure to the air is another cause of cadaveric coloration, which demands brief consideration in reference to the present subject. This variety of redness, which generally begins to appear within a very short time after the removal of the organs from the body, always proceeds with great rapidity in warm weather, especially when the part is brought under the direct influence of the solar rays. The structures in which it is most commonly observed, are the spleen, liver, kidney, and heart, the internal tunic of the arteries and veins, and the mucous membrane of the alimentary tube. In nearly all these situations, the color is of a bright scarlet, like that of arterial blood, and uniformly diffused over the whole, or the greater portion of the organ in which it occurs. In the stomach and bowels, it occasionally presents itself in small florid specks, as if the surface of the lining membrane had been spinkled with vermilion. Absorption of the oxygen of the air, and the admixture of this gas with the blood, are the causes, undoubtedly, under the influence of which this species of coloration is established. Hence, by exposing the affected organ, for a few minutes, to a gentle stream of water, or immersing it in diluted vinegar, it almost instantly changes its florid appearance, and assumes a dark purple hue, similar to that of venous blood.

Such are the varieties of congestion and discoloration, resulting from causes which exert their influence during the last moments of existence, or within the first few days after death. Although, in general, easily distinguishable from those of inflammation, yet it must be confessed that the diagnosis is sometimes extremely difficult, if not impossible, so closely do they run into each other. Under such circumstances, a careful analysis of the symptoms of the case, with the effects of the remedies employed, and an attentive consideration of the ordinary products of morbid action, are absolutely indispensable to a correct appreciation of the nature and character of the supposed lesion. Should there be merely some degree of redness, with ramiform injection, traceable to some large venous trunk, unaccompanied by effusion, softening, opacity, induration, thickening, or ulceration, the presumption is strong that these appearances are the result solely of congestion, produced by some one or more of the causes previously pointed out. If, on the other hand, the discoloration and vascularity are associated with some, or all, of the anatomical characters here indicated, it must be concluded that they are dependent upon inflammatory irritation, since they afford the best possible evidence of the existence of that lesion.

*Theories of Inflammation.*—After what has been stated, it will not be expected that much should be said respecting the various theories, or, rather, hypotheses, that have been projected in relation to the proximate cause of inflammation. A few only of the more prominent will be noticed. The first which I shall mention is that of Boerhaave, which supposes that the disease essentially consists in an obstructed state of the capillaries, produced by some morbid lentor of the blood, or by the entrance of the red globules into vessels not fitted to receive them. This opinion rested on the belief that the sanguineous particles are remarkably complicated in their structure, each red one consisting of six serous, and each serous of six lymphatic ones, for the conveyance of which three kinds of tubules were imagined, as channels of communication between the arteries and veins. By getting into a wrong vessel, the globules might very readily produce obstruction, and thus excite inflammation.

The late Dr. Cullen, of Edinburgh, not less distinguished for his eloquence as a teacher than his ability as a writer, conceived the idea that inflammation was merely a sort of spasmodic contraction of the small vessels, interrupting the passage of the blood. This state, he supposed, was sometimes the effect of direct debility; and he imagined, moreover, that there was frequently a peculiar condition of the whole vascular system, which predisposed to this affection, and which received from him the name of the *phlogistic diathesis.* This theory, notwithstanding the favorable manner in which it was for a long while regarded, has the disadvantage of being unsupported by a single fact. So far from the vessels being contracted in inflammation, it is now well ascertained, as was before mentioned, that they are invariably dilated, and that, in consequence of this, they always admit an unusually large amount of blood, which could not happen were the reverse of this the case.

Dissatisfied with the crude conjectures of Boerhaave, Cullen, and other writers, another theory was proposed by Dr. Vacca, an eminent Italian pathologist, soon after the middle of the last century. In his treatise on inflammation, published at Florence, in 1765, he maintains the opinion that this disease invariably results from sanguineous congestion, attended with more or less debility of the affected part. The first step in the process is relaxation of the capillary vessels, which allows them to be abnormally distended by the blood that passes through them. To this increased quantity of fluid he ascribes the redness, heat, pain, and turgescence, which are always more distinctly marked in proportion to the dilatation of the minute arteries and veins, the violence of the exciting cause, and the natural vascularity of the part concerned.

Since the time of Vacca, the theory of diminished power of the vessels has been warmly advocated by a considerable number of pathologists, especially by Dr. Wilson Philip, Dr. Hastings, and Dr. Thomson. The experiments which were performed by these distinguished writers, although they are at variance as respects some trifling points, all tend to show that inflammation essentially consists in a weakened action of the capillaries, by which the balance between them and the large vessels is destroyed, and congestion is the result. Opposed to these views, again, are those of Mr. Hunter and Dr. Gendrin. These pathologists have both minutely investigated the subject of inflammation in all its departments, and they adopt the belief that the primary cause of the disease is an increased action of the vessels. Amidst such discrepancy of opinion, it might seem, at first sight, extremely difficult, if not impossible, to arrive at any satisfactory conclusion. To me, both views appear to be correct, but not in the sense advocated by their respective authors. In the early stage of the disorder, we have every reason to believe, from the phenomena which are exhibited under the microscope, that the vessels have an augmented action; subsequently, however, when the disease is fully established, the capillaries are partially paralyzed, the blood ceases to circulate, the function of nutrition, secretion, and absorption, is interrupted, and everything indicates the diminished power of the part.

Dr. Bennett, of Edinburgh, has recently attempted to show that inflammation is merely a deviation from healthy nutrition. As in the natural state, the sanguineous liquor, as it is termed, exudes through the capillaries into the interstices of the tissues, furnishing materials for the development of the various textures, so in inflammation the fluid in question passes from the dilated vessels of the affected part, and forms germs for the development of morbid cells, which may lead to the production of pus, to an analogous substance, or to a cancerous growth. Inflammation, according to this view, is synonymous with abnormal nutrition, in which the cardinal symptoms of the disease, namely, heat, pain, redness, and swelling, are merely consequences of the antecedent engorgement and concomitant effusion. The theory of Dr. Bennett does not, in my judgment, throw any new light upon this intricate and mysterious subject, but leaves it precisely where it was. It has been long known that in every well-established inflammation there is "perverted action," with altered exudation, and no pathologist ever supposed that the phenomena usually enumerated as characterizing the process were anything more than effects, consequences, or manifestations of the morbid action which precedes and accompanies it.

Liebig ascribes the essential cause of inflammation to an unusually rapid union of the oxygen of the arterial blood with the tissues of the inflamed part; Henlé to a paralysis of the capillaries; Macartney to a sense of injury felt by the organic nerves; Wharton Jones to an unnatural attraction of the red globules for each other, and for the sides of the minute vessels, which is favored by the increased quantity of fibrin and albumen; Williams to the production of a greater number of white globules, obstructing the vessels by their adhesive properties; whilst quite recently Virchow supports the theory of a local lesion of nutrition, and combines with this the "attractive theory," to explain the stagnation of blood, but not the inflammation.

*Terminations of Inflammation.*—Finally, inflammation ends in different ways. When it gradually subsides, without any untoward occurrence, it is said to terminate in resolution. In some cases it relieves itself by an effusion of serum and lymph, by suppuration, by hemorrhage, and by softening. At other times, the part loses its vitality; and it is then said to end in gangrene. Philosophically speaking, some of these states are merely *conditions*, not terminations of inflammation. Thus, suppuration is absolutely, from first to last, a phlegmasial process; and so of softening, the effusion of serum, and the deposition of lymph. It is therefore rather in compliance with professional usage than with the sound principles of pathology, that we should continue to employ this vague expression.

With respect to acute inflammation, the following terminations may be recognized: 1, resolution; 2, effusion of serum; 3, deposition of lymph; 4, suppuration; 5, hemorrhage; 6, softening; 7, gangrene. These different terminations constitute merely so many degrees of inflammation. Thus, suppuration indicates a higher grade of action than lymphization, and a milder one than hemorrhage, softening, or gangrene. We might thus construct a sort of *phlegmasial scale*, the index of which would be the product of the disease, or the mode in which it terminates.

The various depositions which attend the inflammatory process are an effort of nature to relieve the morbid action; or, what is the same thing, to unload the vessels, and remove oppression. "It is," to use the language of Professor Paine,[1] of New York, "nature carrying on the work of depletion in the very instruments of disease, whilst, as in the effusion of lymph, she may simultaneously accomplish another great final purpose." Effusions seem to relieve vascular distension upon the same principle as the abstraction of blood by the lancet, by purgatives, and by other evacuants. Catarrhal affections of the nose often speedily disappear the moment there is a free discharge of mucus; a deposit of serum may put a sudden stop to a pleuritis; and a violent enteritis is sometimes cured in a few hours by a copious hemorrhage from the bowels. The manner in which suppuration modifies and arrests inflammation has long been familiar to pathologists.

---

[1] **Medical and Physiological Commentaries, vol. ii. p. 330. New York, 1840.**

Chronic inflammation has fewer terminations or conditions than the acute. The principal ones may be thus stated: 1, ulceration; 2, granulation; 3, cicatrization; 4, induration. Besides these conditions, chronic inflammation may occasionally be attended with hemorrhage and softening, or even terminate in gangrene. These occurrences are, however, extremely rare, and are seldom witnessed except when there is a sudden supervention of acute disease. Let us now proceed to describe these different states in the order in which they are here enumerated.

---

## CHAPTER II.

### EFFUSION OF SERUM.

**Occurs, to a greater or less extent, in almost every Inflammation.—Œdema, Anasarca, and Dropsy.—Color, consistence, quantity, and chemical composition.—Usually the result of a mild degree of Inflammation.—Conclusion.**

An effusion of serum, to a greater or less extent, occurs in almost every inflammation. There are some varieties of this disease in which, indeed, it forms the chief if not the only symptom. It is seen most frequently in the interstices of the cellular tissue, on the surface of the serous membranes, in the parenchymatous texture of the lungs, in hydatids, and serous cysts. There are some structures which, from their dense and compact nature, do not seem to admit of this infiltration. Of this description are the liver, kidney, womb, prostate gland, and spleen, together with the tendons, aponeuroses, ligaments, cartilages, and bones. Very little serum is effused by the brain, spinal cord, nerves, vessels, and mucous membranes. With respect to the latter, the parts most frequently and extensively affected, are the margins of the glottis, the conjunctiva, the prepuce, and the nymphæ. Considered in reference to the subcutaneous cellular tissue, the effusion occurs much more frequently in the inferior extremities than in the superior; in the genital organs than in the trunk; in the eyelids than in the face, head, or neck. The lymphatic ganglions and the interfibrillar substance of the muscles are often the seats of considerable serous infiltrations, especially in weak cachectic subjects, or those who are worn out by severe and protracted diseases. Large quantities of this liquid are frequently discharged by the mucous membrane of the bowels, in diarrhœa and cholera. In the skin the most striking exemplification of this effusion is seen in the vesication of an ordinary blister, in burns and scalds, and in the elevation of the cuticle which announces mortification.

Various *names* are employed to designate these effusions. When the fluid is poured out into the interstices of the subcutaneous cellular tissue, it forms a smooth, pale, glossy swelling, which pits on pressure, and is seldom painful, unless there is considerable inflammation. This is called *œdema.* When this affection occurs in the extremities, it generally varies with the position of the body, being very slight or entirely absent when the limb is elevated, and most prominent when it is dependent. The reason of this is obvious. In many cases the fluid is not formed in these parts, but gravitates thither from other regions, making passages for itself through the cellular tissue. As meaning the same thing, the term *anasarca* is sometimes used. The word, however, is generally employed in a more comprehensive sense, to designate the effusion of serum into the meshes of the cellular tissue, in whatever part of the body this structure exists. When the collections occur in the serous sacs, they are called *dropsies.* These, again, are named according to the particular cavities in which they are found. Thus, an accumulation of water in the arachnoid is denominated hydrocephalus; in the spinal canal, hydrorachitis; in the pleura, hydrothorax; in the pericardium, hydropericardium; in the peritoneum, hydroabdominalis; in the vaginal tunic, hydrocele; and hydrarthrosis, in the articulations.

The *color* and *consistence* of the effused fluid are liable to considerable diversity. In some situations, as in the arachnoid membrane and subcutaneous cellular tissue, it is clear and limpid, like the purest spring water; in others, it is more or less viscid, of a pale yellowish tint, and mixed with flakes of fibrin. A lemon-colored serum is not of unfrequent occurrence in the chest, the vaginal tunic of the testicle, and in the articulations of the extremities. Occasionally the fluid is of a pale reddish color, from the admixture of hematosine, and cases are witnessed where it has the aspect and consistence of coffee-grounds. The latter variety is particularly common in inflammation of the peritoneum, caused by strangulation. In jaundice, it sometimes contains a yellow coloring matter, like that of the bile; it has also been found impregnated with cholesterine and uric acid.

Of the *chemical* composition of this fluid very little was known until within the last thirty years. The progress of animal chemistry has taught us that the serous effusions consist mainly of water, albumen, extractive matter, fats and salts. When the inflammation is of an active grade an organizable fibrinous substance is present; sometimes even in considerable quantity. The proportion of albumen is subject to much variety, being very abundant in some situations, and almost entirely wanting in others. The principal saline ingredients are soda and potash, in the form of muriates and sulphates, with phosphate of lime, iron, and magnesia. The specific gravity of the effused liquids is generally less than that of the serum of the blood, and their coagulability is always in direct ratio to the amount of albumen. In the fluid of hydrocephalus and spina bifida the quantity of this substance is frequently so small as scarcely to be rendered visible by heat, alcohol, or acids. From all, then, that we know concerning this matter, it may be legitimately inferred that it is perfectly identical with the serum of the blood from which it is derived, differing from it only in specific gravity, and in the relative proportion of its constituents.

The *amount* of fluid varies from a few drops to several gallons. The rapidity with which it is poured out, even in large quantity, is sometimes surprising. In persons bit by venomous serpents, the whole body often attains an enormous size in the course of a few hours from this source, and some of the internal organs are literally inundated. Usually, however, the effusion takes place more gradually, and never to any considerable extent until the inflammation has attained a certain point. In the serous membranes, for example, which afford this fluid in great abundance, one of the first things that happen, when they are irritated, is the suspension of the natural secretion, which is restored and augmented only after the violence of the inflammatory impulse has somewhat abated. If this should not occur, lymph, not serum, will be furnished, either alone or combined with pus or blood; or the individual, the subject of the disease, will perish from its effects; or the part will fall into a state of sphacelus.

*Causes.*—It has been already hinted that serous effusion is the result of inflammation, usually of a very mild grade. That this is true, as a general rule, cannot be doubted; the exceptions, if there be any, are certainly very rare, and have not yet been satisfactorily pointed out. A few facts, clearly and concisely stated, will materially assist in determining this problem.

It has been alleged, in the first place, that serum is occasionally effused when there is an obstacle simply in the circulation, without any concomitant inflammatory action. It is a matter of common observation with the physician, that anasarca of the lower extremities often arises from obliteration of the femoral, external iliac, and ascending hollow veins; and the face, neck, and arms are frequently loaded with serum from compression of the vessels which return the blood to the right side of the heart. When the portal vein, or any one of its principal branches, is obstructed, abdominal dropsy, or ascites, follows. Contraction of the right auriculo-ventricular orifice, or disease of the valves of the pulmonary artery, impeding the passage of the blood, and compelling it to regurgitate into the inferior cava, produces the same result, together with œdema of the legs and feet. These examples will be sufficient for the subject which they are intended to illustrate. Let us now endeavor to ascertain how far they are dependent upon inflammation, or whether they are the result merely of mechanical obstruction. It is frequently extremely difficult to ascertain the condition of the seat of the effusion by anatomical inspection. In ascites how often does it happen that there is the most copious accumulation of water, caused obviously by inflammation, and yet, on examination after death, there is scarcely a single trace of the latter malady. That there are cases, then, of serous effusions, in which the ordinary phenomena of phlegmasia, particularly the discoloration, entirely vanish on the approach of death, or during the last struggles of life, cannot be doubted; indeed, it is not improbable that there are instances in which this disparition occurs long before the individual expires. The absence of redness, therefore, does not prove that there was no inflammation; for the existence of this lesion is sufficiently evinced by the presence of the watery accumulation, and the opacity of the affected membrane. Should there be, in addition, specks, patches, or bands of fibrin, all doubt on the subject must vanish.

Such, then, being the difficulty of recognizing the presence of inflammation, where every symptom during life gives indubitable evidence of its existence, can it be wondered at that, in the instances above referred to, pathologists should still consider the effusion of serum as the result merely of mechanical obstruction? The question may now be asked, can such an obstruction exist, to any considerable extent, without producing a state of parts analogous to, if not really identical with, inflammation? I answer, no. Let it be supposed that the obstacle exists in the ascending hollow vein. This vessel is destined to return the blood from the inferior extremities, the pelvis and abdomen, to the right side of the heart. But, failing in this, from the difficulty adverted to, the blood is interrupted in its passage upwards, and congestion of all the vessels, both large and small, is the result. This congestion is not transient, but permanent; and it is scarcely reasonable to presume, judging from our knowledge of the circulation, that this state could exist long without producing an altered condition of the sensibility of the parts affected, attended with more or less redness, and effusion of serosity. The peritoneum and cellular tissue of the limbs are the structures which bear the onus of the obstruction, and these, it is well known, are parts which are most liberally supplied with serous capillaries. But, it may be said that the effusion may result from perverted action, from irritation, or disturbed function: all this may be true, and yet not in the least invalidate our position. Everybody knows that in inflammation there is perverted action, or deranged function, with irritation, or altered sensibility. These terms, therefore, if they mean anything at all, only denote certain conditions, not the cause of these conditions; as redness, heat, pain, and turgescence are not inflammation, but only so many symptoms of it.

The preceding remarks are equally applicable to those watery effusions of the serous textures, which occur in association with organic diseases of the glandular and parenchymatous viscera. A large scirrhous tumor of the liver, seated so superficially as to encroach upon and fret its serous investment, is often attended with ascites, although the portal circulation is in nowise obstructed or embarrassed. In the same manner hydrothorax is sometimes induced by tubercles of the lungs; hydrocele by carcinoma of the testicle; hydrocephalus by heterologous growths of the brain. In all these instances the effusion of water is the result, unquestionably, of inflammation, lighted up in the serous covering of the respective organs, by the morbid deposit acting as a foreign substance. The dropsical accumulations which supervene upon scarlet fever, measles, and other eruptive diseases, can be traced, in most cases, directly to phlegmasial irritation of the serous membranes.

Taking into consideration the preceding facts, and the reasoning founded upon them, the conclusion is obvious that the effusion of serosity, no matter in what part, organ, or region it occurs, is invariably the result of a process analogous to, if not strictly identical with, inflammation. This process, I repeat it, is often very imperfectly marked, both during life and after death, so that the ordinary phenomena of phlegmasia are in nowise manifest to our senses.

## CHAPTER III.

### LYMPHIZATION.[1]

**Always the result of Inflammation.—Physical properties of Lymph.—Quantity.—Varieties of Form.—Chemical Constitution.—Period at which the Deposition commences.—Has a tendency to become organized.—How this is effected.—Analogous Tissues.—Use of Lymph as a means of Restoration.—Adhesive Action.**

IF there be still some doubt as to the question, whether the effusion of serum is invariably of inflammatory origin, there can surely be none respecting that of fibrin. So true is this, in reference to the latter product, that it may be assumed as a law, than which there is none more satisfactorily established in pathological science. Yet, as in the former case, examples not unfrequently occur where the fibrin constitutes the only sign observable after death, of the previous existence of inflammation. In arachnitis, large quantities of this matter are often poured out, without our being able to detect the slightest redness, opacity, or thickening of the serous membrane. Nevertheless, it would be absurd to say that, because some of the ordinary phenomena are wanting, there had been no inflammation.

Lymph is a vital, organizable substance, separated from the blood by a process of secretion, similar in kind to, but different in degree from, that which presides over the elaboration of serum and pus. In its physical properties it is liable, like other morbid products, to be modified by adventitious circumstances, and hence it does not always exhibit the same appearance. In general, it is transparent, and of a white, yellowish-white, or opaline tint; but it may be opaque, cineritious, milky-white, or reddish. In jaundice, I have seen it of a pale yellowish hue, from the presence of the coloring matter of the bile. At first it is very soft, semi-liquid, or almost diffluent, and so viscid that it may be drawn out into thin filaments; but it gradually increases in consistence, assumes a retiform arrangement, and feels very much like a mass of cobwebs moistened with water. When squeezed, it yields a small quantity of fluid identical with the serum of the blood. If the circumstances under which it is deposited are favorable, it is either absorbed, or a part of it remains, becomes organized, and is rendered capable of being converted into a great variety of tissues, such as the cellular, serous, fibrous, cartilaginous, and even the osseous. The period necessary for these transformations varies from a few days to many months.

---

[1] As this term is not to be found in any of our pathological treatises, it is necessary to observe, that it is employed herein the same sense as "effusion of lymph" or "deposition of fibrin." We say a part is in a state of suppuration when it is secreting matter; with the same propriety we may say that a structure is in a state of lymphization, when it is pouring out lymph or fibrin.

Under the *microscope* lymph does not always present the same characters. It is, in general, found to be composed of a large number of globules, cells, and granules, lying in a transparent matrix. The globules or exudation-corpuscles resemble, at first, the ordinary chyle-corpuscles or white corpuscles of the blood, but in their development may give rise to all the different forms of plastic cells described by authors, or they may degenerate into granular masses, and perhaps also into pus-cells. The matrix is generally hyaline and indistinctly fibrillated, or may consist of distinct fibres, or of networks of delicate fibrils inclosing nucleated cells of different size. From these elements tissues are formed in the same manner as the textures are originally developed. Sometimes exudation-corpuscles and cells are entirely absent in lymph, and the whole mass consists of a fibrillated texture or of a fibrous blastema; or it may contain large, irregular, flaky masses. The granules exist in lymph in uncertain proportion, and are, in fact, not always of the same nature; some appertain to the organization, others to the breaking up of the inflammatory product. An element repeatedly met with in inflamed tissues is the granule-cell, or inflammatory globule of Gluge. It is a large distinct cell made up of numerous granules, and generally has a distinct cell-membrane. This cell-wall may burst, and the granules be dispersed in the inflamed parts. It is highly probable that these granule-cells are owing to a fatty degeneration of pre-existing cells. They are not met with merely in inflammatory lymph.

Basing their views on these varying minute appearances, some pathologists maintain the doctrine of an essential difference in the character of the effused lymph, and thus seek to explain the different terminations of inflammation. Rokitansky, for example, divides fibrous exudations into the *plastic* and *croupous*. The latter, consisting almost entirely of nucleated formations and corpuscles, occurs more especially in mucous membranes, and is distinguished for its tendency to extend over large surfaces, and to corrode, when it breaks up, as it is very prone to do, the tissues with which it is in contact. He mentions, in addition to the plastic, an albuminous, serous, and hemorrhagic exudation.

Mr. Paget makes a similar division. He distinguishes two forms of inflammatory lymph, the *fibrinous* and *corpuscular*. The fibrinous has the general properties of the fibrin of the clot of the blood, soon coagulating into a solid form. Microscopically, this fibrinous lymph is characterized by the small proportion of exudation-corpuscles. It is tough and semitransparent, and occurs chiefly in acute inflammations of serous membranes, especially in vigorous persons. It is prone to organize into tissue, and leads to adhesions and indurations, hence it frequently exhibits the cells and fibres of developing structure. In the corpuscular lymph the exudation-corpuscles are in great abundance, and little healthy fibrin is present. This variety of lymph tends to suppurative inflammation. It is generally seen in patients of deficient vital powers. Between these two forms numerous intermediate stages are observed.

Thus it would seem that the state of the blood exerts a strong influence on the production of the different varieties of inflammatory lymph. The fact, also, of the various forms of fibrinous coagula in the heart, showing, at times, a firm fibrillated structure; at others, a granular mass with numerous corpuscles, and corresponding with the lymph out of the bloodvessels, and more or less with the general condition of the body, renders it highly probable that the form of exudation is pre-determined by the state of the blood. Possibly, also, although in a less degree, the seat and intensity of the inflammation may aid in producing different blastema. It remains for future research to establish these observations on more positive grounds; especially ought we to investigate the chemical relations of the exuded lymph to the circulating blood. We shall have occasion, when speaking of suppuration, to return to this question.

Fig. 7 displays a portion of recently-effused lymph, opaque, white-colored, friable, and magnified about 380 diameters, from traumatic inflammation of the peritoneum of a horse. It is composed of globules, smaller molecules, and granular matter in a hyaline matrix. In the lower part of the figure the granules and molecules are shown as floating in serous fluid. In Fig. 8, the structure of the effused matter is somewhat different. It forms, in fact, a sort of false membrane, magnified 800 diameters. Numerous corpuscles are seen, more or less globular, and having the character of primary cells; the intervening

Fig. 7.

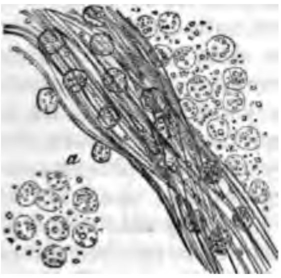


Fig. 8.

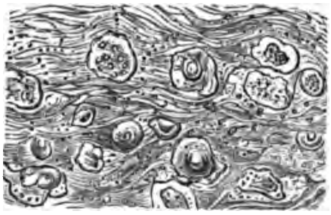


Fig. 7. Plastic corpuscles and filaments in recent lymph exuded on the pleura. *a.* The corpuscles unchanged by acetic acid.—Bennett.

Fig. 8. Recent lymph, forming false membrane.

texture is formed of most delicate fibrils. A few minute granules are interspersed through the tissue.[1]

The *chemical composition* of lymph proves it to be similar to the buffy coat of the blood. The researches of Lassaigne have thrown additional light on this interesting subject, by showing that the false membranes of the serous and mucous cavities are composed mainly of fibrin, with a small quantity of soluble albumen and a yellow-colored serum, containing all the organic and saline elements of the blood. Immersed in alcohol, or a strong solution of corrosive sublimate, the effused matter becomes dense and firm, and assumes a whitish, shrivelled aspect. In water it is gradually decomposed, and broken up into small, dirty, rotten-looking fragments, which readily yield under the pressure of the finger.

Lymph is effused under a considerable variety of *forms*, depending upon the peculiar shape of the part which supplies it. In the subcutaneous cellular tissue it usually occurs in small amorphous masses, or in disseminated globules. In the larynx and trachea, it accurately moulds itself to those cavities. In the peritoneum, it forms bands, occasionally of considerable length, which extend from one coil of bowel to another; in the pleura it is commonly laminated. To these statements there are, of course, numerous exceptions, which will be adverted to in other parts of this treatise.

The *quantity* of fibrin poured out is subject to much diversity. In general it is furnished most abundantly by the serous sacs; yet, under certain circumstances, large quantities are effused by the mucous membranes of the respiratory and intestinal tubes, as well as by that of the œsophagus and uterus. Happily, however, this substance rarely remains long in these outlets; otherwise the most serious consequences might ensue. As it is, in the trachea it often produces death, by preventing the ingress of the atmosphere; the lachrymal passages, and many of the minute bronchial canals are sometimes obliterated by it; in the urethra it lays the foundation of permanent stricture; and in the chest, by tying down and compressing the lungs, it may give rise to atrophy, or otherwise embarrass the respiratory function.

Considerable quantities of fibrin are not unfrequently found on the inner surface of the arteries, the largest sized trunks of which are occasionally obliterated by it. The muscles, fibrous membranes, tendons, ligaments, cartilages, and bones yield very little when in a state of inflammation. The skin, veins, and absorbents furnish it also very sparingly. A good deal is generally effused in phlegmasia of the subcutaneous cellular tissue, around abscesses, and upon the walls of fistulous passages. With respect to the parenchymatous and glandular organs, the effusion of fibrin may be said to be in direct proportion to the amount of cellular substance which enters into their composition, being always very small when their structure is dense and compact, and more or less copious when it is soft and lax.

The *period* at which the deposition of lymph commences is influenced by different circumstances, the principal of which are referable to the intensity of the inflammation and the nature of the affected structure, tissue, or organ. If an incision be made into the skin of the finger, its surface will become covered with plastic matter within less than an hour after it has ceased to bleed; and the flaps of the stump in amputation often become thoroughly glazed with lymph nearly in the same time. Some years ago I had occasion to operate upon a gentleman on account of internal strangulation of the bowel. Some adhesions were found between the intestinal convolutions, but they were slight. The man died precisely four hours after the operation; and, on laying open the abdomen shortly afterwards, I discovered a thin film of lymph spread over nearly the whole of the small bowel, and also over a large part of the parietal portion of the peritoneum. In a young man who died under my care of a gunshot wound, which penetrated the liver and diaphragm, I found both the pleura and peritoneum extensively coated with this substance nine hours after the reception of the injury. In many cases there is reason to believe that the effusion takes place almost at the very onset of the inflammation, and that it proceeds, with greater or less rapidity, until the disease either abates, passes into suppuration, assumes a chronic form, or destroys life.

---

[1] Gulliver, Appendix to Gerber's General Anatomy, Pl. p. 59—65.

If this substance remains undisturbed, it manifests a disposition to become *organized*. The period within which this happens varies from a few hours to several weeks. The serous membranes are the structures in which the organization is accomplished with the greatest ease and rapidity; while in the mucous it either does not take place at all, or very imperfectly, and only after a long time. It is likewise effected with great facility in the skin, in the cellular tissue, and in fractured bones. The organization of the effused substance is greatly influenced by the state of the constitution, by the nature of the preexisting texture, and, above all, by the amount of its own inherent vitality. When this is of a low grade, the lymph either dies, and thus becomes a source of mischief, or it becomes vascularized, and undergoes a slow conversion into an analogous tissue.

How this vascularization is effected is an interesting subject of inquiry, and one which has excited much discussion among pathological anatomists. That it is produced in one of two ways, is sufficiently obvious; either by the vessels of the natural tissues shooting into it, or spontaneously by powers residing within itself. Proofs are not wanting in support of both views. In removing, for example, a recently formed adventitious membrane, we not unfrequently find its adherent surface marked by numerous bloody points, caused evidently by the rupture of the elongated capillaries of the inflamed normal membrane. What renders this supposition the more probable, is the fact that the free surface of the serous membrane—for it is to this class of textures that these remarks are more particularly intended to apply—is studded with very minute granulations, which are highly vascular, and accurately correspond in their situation with the red dots observable on the attached surface of the new membrane. These granulations become gradually more and more distinct, both on the original and on the adventitious structure; and, by means of a magnifying-glass, very delicate slender vessels, arterial as well as venous, may be seen passing from the substance of the one into that of the other. As the penetrating vessels increase in volume and number, the lymph adheres more firmly to the inflamed surface of the natural membrane, until at length the circulation between them is fully established, being carried on with the same freedom and vigor as in other regions of the body.

The second opinion—that, namely, which supposes the lymph to possess a self-vascularizing power—ranks amongst its advocates some of the most distinguished pathologists of the last and present centuries; and the facts which they have adduced in favor of their position go far, it must be confessed, in leading us to doubt whether this substance, in whatever form it may appear, is ever vascularized in any other way. They have shown, most conclusively, as it seems to me, that portions of exuded lymph contain vessels, and perform the functions of nutrition, secretion, and absorption, before it is possible to trace the slightest vascular connection between them and the surrounding textures. In the pleura, it has often occurred to me to see as many as three, four, five, and even six distinct layers of this substance, arranged so as to intercept cavities of various sizes, filled with serum, flakes of fibrin, pus, and even blood. In some of the cases, the circumstances were such as to render it perfectly certain that the development of these adventitious membranes must have taken place with so much rapidity as to preclude the idea that their vascularization could be effected through the agency of the subjacent serous structure. There is, therefore, reason to believe that lymph possesses, in many instances, an inherent self-creating power, in virtue of which it forms blood which gradually prepares its own vessels. What the precise nature of this vitalizing influence is, we cannot, of course, determine: the difficulty, surely, cannot be solved by invoking, as has been done by Andral, the agency of the electric fluid. Of the intimate character of this fluid we know as little as of life itself; and the notion just alluded to is, therefore, ill calculated to enlighten us on a subject concerning which we must necessarily remain forever ignorant.

The traces of the organizing process are seen in numerous cell-formations of every conceivable shape and size. From these cells are formed the tissues, in exactly the same manner as in perfectly normal structures. The greatest tendency of lymph is to develop itself into

Fig. 9.

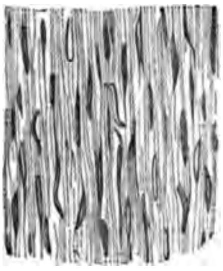


Fig. 10.

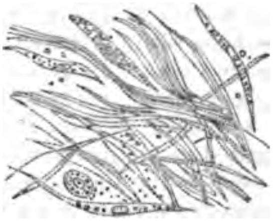
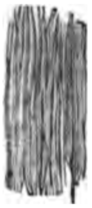


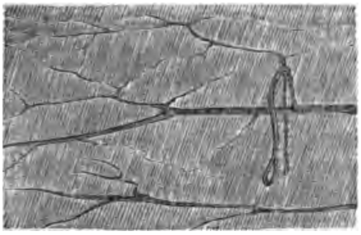
Fig. 11.



Figs. 9, 10, from Bennett, show nuclei and cells developing themselves into fibres: whilst Fig. 11 shows a perfect fibrous tissue.

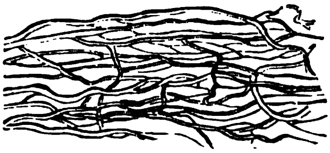
fibrous tissue. It always assumes the character of the structure in which, or near which, it is effused. Thus, in and around a bone, osseous tissue is formed from the inflammatory lymph. These transformations may occur even before bloodvessels in the part are organized. It is certain that these are not the only necessary organizing element, and it is impossible to avoid the conclusion that coagulating lymph is susceptible of spontaneous development, and endued with a certain amount of vitality. It derives assistance and nourishment from the original structures, but it is capable of effecting its organization by its own inherent life-power. If possessed of a feeble vitality it will break down and become effete. The study of the development of normal tissues, especially since the introduction of the cell doctrine, has taught us how structures are organized; and why should not the same laws govern the development of lymph when effused by the inflammatory process? It may, in fact, be fairly presumed that all constituents of the body can be formed in coagulating lymph. That vessels can be there created is certain. Independently of the facts already adduced, the experiments of John Hunter and Everard Home, in which the vessels formed in a clot of blood were successfully filled with injecting matter, place this subject in a most incontrovertible light. Shrœder Vander Kolk,[1] detected, with the aid of a magnifying power, numerous vessels, finer than the most delicate hair, and terminating in a cul-de-sac, in a piece of false membrane floating about in the midst of a serous fluid; it was still soft, gelatinous, and entirely free from adhesions.

Fig. 12.



Newly-formed vessels in plastic lymph.

Fig. 13.



False membrane of the pleura.

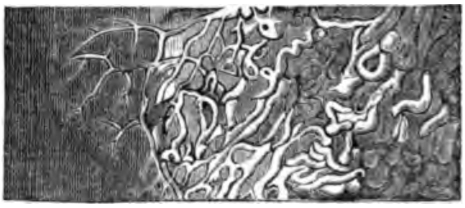
The arrangement of the newly-formed vessels is represented in the annexed sketches, from plates by Hunter and Lobstein. Fig. 12 is a portion of coagulating lymph attached by a narrow neck to the peritoneal coat of an inflamed intestine. The vessels have a ramiform disposition, and freely anastomose with each other. Fig. 13 is a piece of false membrane of the pleura. The vessels are large, numerous, and farther advanced than in the other sketch. Fig. 14 affords a good illustration of the vessels of a coagulum of blood, as seen by Hunter and Home.

Nothing is known, with any certainty, concerning the *nerves* of this organized matter. They have been detected only a few times in adventitious membranes;[1] that they exist, however, may be legitimately inferred from the fact that they are capable of executing the highly important function of nutrition, secretion, and absorption, which, but for this circumstance, they could not possibly accomplish. My opinion is, that plastic lymph, in whatever part of the body it occurs, in its progress towards organization, either generates its own nerves, or receives them from the neighboring tissues, in the coats of the vessels. I am the more inclined to adopt this view from the analogy afforded by some of the primitive textures, as the osseous and cartilaginous, which, there is reason to believe, obtain their nervous supply in this way. Absorbent vessels also exist; but their presence, like that of the nerves, has hitherto been a matter rather of inference than of actual observation. Shrœder Vander Kolk[2] has, however, satisfactorily demonstrated them in the false membranes of pleuritis. His preparations are injected with quicksilver, and are said to exhibit the characteristic knotty arrangement observable in the lymphatic vessels of the natural tissues.

---

[1] Observationes Anatomico Pathologicæ et Practici argumenti, p. 20.

Fig. 14.



Plastic lymph, organized in the manner now described, forms the basis of all the analogous tissues, and the bond of union of divided parts. It may become the seat of inflammation, both acute and chronic; pour out serum, lymph, pus, and even blood; and undergo the same transformations precisely as the natural textures. It is likewise the source of what is termed induration, and probably, also, in a modified form, of scirrhus and tubercle.

The *analogous tissues* formed, as just stated, out of the plastic element of the blood, are nearly as numerous as the natural, to which, as their name imports, they bear the closest resemblance in the threefold respect of physical, chemical, and vital properties. The following arrangement embraces the different kinds of textures pertaining to this class which have hitherto been described by authors: cellular; serous; mucous; cutaneous; vascular, including the erectile; adipose; horny, including the cuticle, hair, and nails; fibrous; fibro-cartilaginous; cartilaginous; osseous. These tissues will be described in their appropriate place. In the mean time, it may be remarked concerning them, generally, that they do not occur with equal facility; that they are more prone to form in the old than in the young; and that, whilst some most closely resemble the tissues from which they have received their names, the likeness of others is faint and imperfect.

---

[1] By Virchow. See Wurzb. Verhard, i. 144.

[2] London Medical Gazette for Jan., 1843.

It has been already intimated that coagulating lymph performs a most conspicuous part in the reunion of divided parts. Without the assistance of this substance, no wound, however trifling, could possibly get well. The little incision made in the operation of venesection would either prove fatal, or become a source of permanent inconvenience and suffering. Ulcers would not heal, and fractured limbs would dangle about "in wild uncertainty." Formerly surgeons seemed to be entirely ignorant of the utility of this substance as a means of repairing injuries, whether occurring in the soft or hard parts of the body. It remained for Mr. Hunter to exhibit the subject in its true light, by which he created an epoch in the history of the science, amongst the most interesting that have occurred.

As admitting of the most easy examination, attention may be here directed to the part which this substance performs in the reparation of wounds of the cutaneous and cellular tissues. If these structures be simply incised, the edges of the cut surface, if kept in close apposition with each other, are united by what was formerly denominated *first intention*, or, since the time of John Hunter, union by *adhesive inflammation*. In a case of this description, the first thing that nature does is to set up a new action in the part—that is, the wound becomes red, painful, hot, and tumid—phenomena which clearly indicate that her workmen are busily engaged in repairing the injury which has been sustained. Plastic lymph is now thrown out, by which the contiguous surfaces of the incision are gradually and effectually agglutinated together. Whilst this secretion is in operation, the vessels of the part are elongated, and, passing through the bond of union thus set up, they finally inosculate with each other, transmitting thereby the blood through the new substance, which, at the same time, increases considerably in firmness and density. Similar changes take place with respect to the nerves and absorbents. Thus the effused lymph becomes a living intermedium; and it is in this way that the restoration of divided parts, no matter what may be their structure, is effected. That the process, however, may go on kindly, it is essential that the concomitant inflammation shall not transcend certain limits; otherwise there will be suppuration instead of lymphization.

It is upon a knowledge of this property of coagulating lymph that are founded some of the most astonishing improvements that have been achieved by modern surgery. Amongst these the most remarkable are the operations for tying arteries, in cases of aneurism, so much perfected, if not devised, by John Hunter; and for repairing mutilated organs by transplanting parts from one region of the body to another. Much good has also resulted in respect to the treatment of incised wounds, whether produced by accident, by the removal of a tumor, or the amputation of a limb. In all these instances it is customary, in every part of the civilized word, except, perhaps, France, to endeavor, if possible, to bring about union by the first intention; the surgeon well knowing that if this can be effected he will save himself much trouble, and the patient no little suffering and inconvenience.

The effusion of lymph is a means employed by nature to obviate accidents. A convincing proof of this is witnessed in cases of tubercular phthisis. In this disease, abscesses generally form in the superior lobes of the lungs; these are sometimes seated quite superficially; at other times they are exceedingly capacious, and extend in different directions until they make their way completely through the pulmonary tissue, and even the pleura. But does the softened tubercular matter usually escape into the cavity of the chest? By no means. Long before the event alluded to takes place, inflammation is set up in the surrounding serous membranes, followed by a copious secretion of lymph, by which an effectual barrier is opposed to the extravasation of the purulent fluid. Similar phenomena occur in ulcerations of the bowels, and in abscesses of the abdominal and pelvic viscera.

## CHAPTER IV.

### SUPPURATION.

**Definition.—Organs in which it is most easily effected.—May take place without Solution of Continuity.—Varieties of Form.—Abscesses.—Physical and Chemical Properties of Pus.—Distinguishing Tests.—How produced.**

A THIRD mode by which inflammation relieves itself is suppuration. This consists in the formation of purulent matter, and constitutes, strictly speaking, merely the third stage of inflammation, inasmuch as pus is never deposited when there is an entire absence of this state. That this position is correct, will hardly be doubted. Hunter, it is true, is of opinion, that collections of extraneous matter, as he terms them, may form in various parts of the body, without any antecedent inflammation; but in this notion he has not been followed, so far as I know, by any respectable authority since he promulgated it. Indeed, if any one will take the trouble to peruse the chapter which this great pathologist has published on this subject, he will be struck, at almost every line, with the vagueness of his expressions and the inconclusiveness of his reasonings. In what is called a cold abscess, the formation of which is sometimes the work of months, inflammation is just as much concerned as in a phlegmonous boil that is developed in two or three days. The only difference is, that, in the one the process goes on slowly, almost imperceptibly; while in the other it proceeds rapidly, and is accompanied with symptoms so well marked as not to be mistaken.

The formation of purulent matter does not take place with equal facility in all the organs and textures. Of the viscera, those which are most prone to take on suppurative action are the liver, lungs, and brain; of the tissues, the cellular, the cutaneous, mucous, and serous. In the fibrous textures, the cartilaginous, tendinous, and osseous, this fluid forms with difficulty, and is seldom of a thick, consistent nature.

Of the mucous system some portions are more liable to be affected with suppuration than others. Thus, it is much more common to find pus in the colon than in the stomach or ileum, in the vagina than in the uterus, in the urethra than in the urinary bladder, in the nose than in the mouth, in the fauces than in the œsophagus, in the bronchiæ than in the larynx. So, likewise, in the serous system, suppuration is more frequent in some situations than in others; as, for example, in the pleura, the vaginal tunic of the testicle, and the lining membrane of the larger joints. In the subcutaneous cellular texture, pus is most readily formed in those parts which are remote from the central organ of the circulation. The bloodvessels do not often suppurate, except when wounded; and the same, so far as we know, is the case with the absorbents. The lymphatic ganglions, however, are very frequently affected in this way, especially those of the axilla, the groin, the mesentery, and the base of the lower-jaw, in persons who are predisposed to scrofulous disease. The nervous tissue seldom suppurates, and still more rarely the muscular. From all these facts we may deduce the axiom, that those structures are most prone to form matter which contain the largest amount of loose cellular substance, and, conversely, that those which possess this tissue sparingly always suppurate with difficulty, requiring in general a much longer period, and elaborating a less perfect fluid.

It is well known that pus may be formed without any solution of continuity. This mode of suppuration, in fact, is very common, not only in all the serous cavities, but throughout nearly the whole of the mucous system. It is not, however, confined to these textures. In the cellular substance, in the lungs, brain, liver, and other viscera, nothing is more frequent than suppuration, without any breach whatever, in the first instance, of continuity.

Pus, when first effused, generally appears in the form of distinct globules, which are dispersed through the affected structure, and can be easily recognized by their pale yellowish color. As the purulent particles increase in number, they gradually become confluent by the absorption of the part concerned, and in this way the matter is at length collected into an abscess.

*Abscesses.*—Abscesses are usually divided into three classes, the acute, the chronic, and the metastatic. This arrangement is founded on their mode of origin, and is of great pathological as well as practical interest.

The period required for the formation of an *acute abscess*, often termed *phlegmonous*, depends a good deal upon the constitution of the patient, the nature of the exciting cause, the degree of inflammatory action, and the anatomical elements of the part affected. In the lungs, brain, spinal cord, and spleen, death usually takes place before the matter has time to concentrate itself into a focus; and hence, in examining persons who have died of acute diseases of these organs, it is extremely rare to meet with an abscess even of small size. On an average, the period necessary for the formation of visceral collections of this kind may be stated at from twelve to fifteen days; whereas in the subcutaneous cellular substance, abscesses often make their appearance in less than a week, sometimes, indeed, in less than forty-eight hours, from the commencement of the inflammation.

When the abscess is superficial it always manifests a tendency to extend to the cutaneous surface, where it ultimately points and breaks. The period required to effect this depends very much upon the activity of the absorbent vessels, and the nature of the parts by which the fluid is covered. The process itself is denominated ulcerative absorption, and is always greatly promoted by the pressure of the confined matter. Its progress may be temporarily resisted by aponeurotic and other structures, but it ultimately surmounts every obstacle, though, perhaps, at the expense of much suffering. When the pus is long retained, it may commit extensive mischief by burrowing among neighboring parts, as is exemplified in whitlow, erysipelas, and abscess round the anus.

Visceral abscesses, on the other hand, usually discharge their contents into some hollow organ, or they burst into a splanchnic cavity. This is the ordinary tendency of purulent collections of the liver and spleen; sometimes, however, they pursue a more tedious and devious route, through the walls of the abdomen. Abscesses of the lungs usually open into a neighboring bronchial tube, from which the matter is afterwards expelled by coughing. In the kidney, the purulent fluid may escape along with the urine, or it may be retained, and ultimately find an outlet through the bowel, the external surface, or the peritoneal cavity. In the brain, as there is no vent for the pus, the abscess almost always proves fatal.

The purulent matter is sometimes inclosed by a layer of plastic matter. This substance, which is furnished by the neighboring vessels, and which presents itself in the form of a distinct sac, cyst, or bag, technically called the *pyogenic membrane*, varies in its properties in different cases and even in different parts of the same preparation. In recent cases, it is always much softer than in those of long standing, owing to the new product not having had time to become thoroughly organized and converted into a complete membranous pouch. In thickness it varies from the fourth of a line to a quarter of an inch, or upwards. Its consistence is often equal to that of a fibrous membrane, though generally it is much more easily torn. Externally it is rough, flocculent, and firmly united to the surrounding tissues, which are at the same time preternaturally dense and vascular. The inner surface of the sac is either smooth and glistening, or villous and granulated, of a pale ash, or reddish color, and constantly bathed by purulent fluid.

The manner in which this cyst is organized does not differ from that of the adventitious membranes generally. Its vessels are usually very numerous; and, although they are extremely minute, may be readily injected with fine size. The presence of absorbents is rather inferred from one of the functions of the sac than established by actual demonstration. That the contents of an abscess may be removed by the powers of the system, is well known to every surgeon; the process, indeed, often occurs spontaneously; at other times means are employed to excite and promote it. No nerves have been traced into it; although it is certain that it must be well supplied with them.

Thus, we perceive that this pseudo-membrane is a highly organized structure, capable of performing important functions, and of awakening important sympathies in the system. It not only completely isolates the abscess from the surrounding parts, but it secretes, and often absorbs, the matter which it contains. It has been thought that its formation always precedes that of the pus, and that it thus becomes the immediate secerning tissue. This opinion, however, is only partially correct. After it is organized, the pouch must necessarily secrete its own contents; but at an early period the matter is furnished by the vessels of the adjacent tissues, with which it is in immediate contact. We must, therefore, suppose that the membrane is formed subsequently to the abscess which it is destined to circumscribe.

When an acute abscess is formed with great rapidity, as when it is seated beneath the skin, the matter is either extensively diffused through the interstices of the cellular tissue; or it is circumscribed by a deposit of lymph, which is generally absorbed as soon as the fluid ceases to be secreted. It never presents itself, as in other cases, in the form of a distinct membranous pouch.

Acute abscesses offer much variety with respect to their volume. In general, their dimensions are in direct ratio to the spongy and vascular structure of the affected part. Thus, abscesses of the glandular organs, with the exception perhaps of the liver, are seldom so large as those of the groin, axilla, lumbar region, or the retro-peritoneal cellular substance, where they may attain a magnitude capable of holding several pints or even quarts. The number of acute abscesses is also liable to considerable variety. While in some cases there is only one, in others, as in some of the deep-seated viscera, there may be as many as a dozen, twenty, forty, or even fifty. In smallpox, the number of little abscesses on the surface of the skin is often immense. Their contents are generally of a healthy or laudable character, and vary from a few drops to several ounces, pints, or even quarts; occasionally they are mingled with clotted blood, shreds of cellular tissue, or the debris of the organ in which the abscess is situated.

The formation of this variety of abscess is generally attended by well-marked symptoms. The pain loses its intensity, and changes to a throbbing or pulsatile sensation; the swelling becomes soft, but more prominent; the surface assumes a purple or livid aspect; fluctuation is perceived; the tumor points, the skin is attenuated, and the ulcerative absorption still continuing, an aperture takes place, which allows the contents to escape. Matter issues through the opening for some time afterwards; but the cavity of the abscess gradually contracts, and its sides are ultimately united either by granulation or direct adhesion. The same mode of cure is employed by nature when the matter is absorbed.

An abscess is said to be *chronic* or *cold* when the matter forms very slowly, and the morbid action which precedes it is so mild as to escape recognition. There is usually no pain, heat, or redness of the affected part, and hence the disease often exists for months before it attracts attention. On this account the term cold abscess has properly been applied to it. In its quantity, the matter varies from a few ounces to several pounds; it is generally of a whitish, yellowish, or greenish color, of a thin, whey-like consistence, free from odor, and intermixed with small caseous flakes, not unlike particles of soft-boiled rice. If it be allowed to stand for some time, it separates into two parts, one of which is serous, the other fibrinous, or, more properly speaking, tubercular. The fluid, in fact, is essentially scrofulous, and bears the greatest resemblance to the pus of a pulmonary cavern. An abscess of this kind has always a distinct cyst, of a dense fibrous texture, which is closely connected with the surrounding tissues, and is often several lines in thickness. Owing to this circumstance, the matter manifests little tendency to make its way to the surface; instead of this, it extends in different directions, forming frequently long and tortuous tracks before the superincumbent integuments are destroyed by ulcerative absorption. If the cyst be punctured, and its contents evacuated, the accumulation will be as great as ever in the course of five or six days. When the matter passes from one part to another it constitutes what is called a *congestive abscess.*

Chronic abscesses are most common in the subcutaneous cellular tissue, the lymphatic ganglions, and the dorso-lumbar portion of the spine. They are usually situated about the chest, in the neck, groin, axilla, the loins, and the circumference of the pelvis. There is seldom more than one, but occasionally two, or even three are observed in the same subject. They are generally of an irregular figure, and frequently present themselves at a distance of many inches from the original seat of their formation. Of this an example is furnished by psoas abscess, which always begins in disease of the spine, and often extends to Poupart's ligament or even beyond it.

This variety of abscess is always connected with a scrofulous state of the constitution; and, although there is generally an absence of the ordinary phenomena of inflammation, there can be no doubt that the influence of this process is essential to its production. The disease may last for several years before it finally disappears, or destroys life. As long as the abscess remains closed, the constitution does not seem to be disturbed by its presence; but no sooner is it opened than important sympathies are awakened, and the resultant irritation may be so violent as to prove fatal in a few days.

The *metastatic abscess* is most common in the internal viscera, beneath the peritoneum, and in the joints. It is also observed, though not so frequently, in the subcutaneous cellular tissue and in the muscles. The causes under the influence of which it is developed, are, injuries of the head, extensive wounds, compound dislocations, comminuted fractures, and capital operations. It also occurs during the puerperal state, and as a consequence of phlebitis, erysipelas, typhoid fever, pneumonia, and other diseases. It most frequently affects the lungs and liver, then the spleen, and lastly, the brain, heart, and kidneys. It always selects the most vascular portions of these organs, and hence their periphery suffers much oftener than their centre.

In regard to their number, metastatic abscesses vary in different instances. It is seldom that we find only one; most generally there are as many as twenty, thirty, fifty, or even a hundred. Sometimes, indeed, the surface of the affected organ is completely studded with them, more than a thousand having been observed in a single case, principally in the deep-seated viscera. The size of this abscess is also very various. Some do not exceed that of a hemp-seed or garden pea; but others are as large as a hazelnut, a marble, a pigeon's egg, or an orange. When very numerous, they are usually proportionably small. In their figure they are generally oval, spherical, or angular; sometimes remarkably irregular. When seated near each other, they occasionally become confluent, like the pustules of smallpox.

The contents of a metastatic abscess are seldom of the nature of well-elaborated pus; on the contrary, they are almost always of a semi-concrete consistence, of a dirty grayish, cineritious, or drab color, and composed mainly of a plastic lymph. This is particularly true of recent cases; in those of longer standing, the contents are more decidedly purulent, but even then they are often blended with grumous blood and flakes of fibrin.

The textures immediately around the abscess may be natural, or variously altered in their appearance and consistence. In most cases they are engorged with blood, heightened in color, softened, or converted into a pulpy diffluent substance. The coats of the vessels are inflamed, thickened, and infiltrated with serosity, while their canals are filled with pus, semi-fluid blood, or fibrinous concretions. The capillary veins usually participate in the inflammation.

The period which intervenes between the occurrence of the exciting cause and the actual development of the abscess varies from five to fifteen days. The matter generally forms in a very rapid and stealthy manner, unaccompanied by pain, heat, or redness of the part which it selects for its seat. The most prominent symptoms are, violent rigors, usually paroxysmal in their character, delirium, stupor, prostration, and general insensibility. The development of this abscess has been variously explained. The ancients were of opinion that it was the product of metastasis; or, in other words, that the pus was absorbed from the part originally affected, and transported to some other situation, where it was collected into a focus. This view is still entertained by many pathologists; but it has been conclusively proved, by a number of well-attested facts, that the abscess is the result of phlebitis, and that it often exists independently of the suppurative process in the organs and tissues which sustained the primary mischief. It is an interesting observation in connection with this subject that in the circulating fluid none of the corpuscles of pus can be detected. Masses of coagulated fibrin have, on the other hand, been repeatedly observed.

*Nature of Pus.*—The subject of abscess necessarily brings us to the consideration of the physical, microscopical, and chemical properties of pus. When genuine, or, as it is not improperly called, healthy, pus is of a pale yellowish tint, opaque, homogeneous, of a sweetish taste, without any particular smell, and of the consistence of thin cream. It is heavier than water, in which it is partly dissolved, emits a faint, mawkish odor on being heated to the natural temperature of the body, resists putrefaction with remarkable pertinacity, and is coagulated by heat, alcohol, and muriate of ammonia. Pus freezes less rapidly than water, and when thawed it does not regain its original properties.

The specific gravity of pus is liable to considerable variation. It is less than that of blood, and greater than that of serum. According to Gueterbock, it ranges from 1030 to 1033. In seven distinct examinations of pus, taken from abscesses in different situations—as the thigh, arm, axilla, back, pleura, and the lung in pulmonary phthisis—Dr. John Davy found the specific gravity as low in one as 1021, and in another as high as 1042. This great disparity is mainly attributable to two circumstances, the unusual quantity of the solid ingredients, and the variable density of the liquid part.

Pus, when microscopically examined, is found to be composed of numerous small corpuscles suspended in a thin transparent fluid. These little bodies, which have received the name of *pus-globules*, are generally of a spherical form, and vary in size from the $\frac{1}{2000}$th to the $\frac{1}{3000}$th of an inch in diameter. They are mostly very granular, and possess a delicate cell-wall, which becomes distiuct on the addition of water. They are nucleated; some containing one well-defined nucleus; others two, three, or more small nuclear bodies. Acetic acid has the effect to render them apparent; the cell-contents and wall become transparent under its influence, especially if the acid be undiluted. Fig. 15 exhibits pus-corpuscles in their natural state.

Fig. 15.

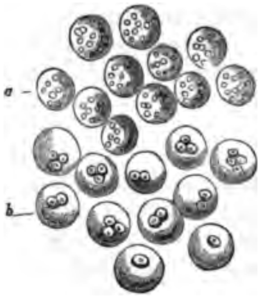


Fig. 16.

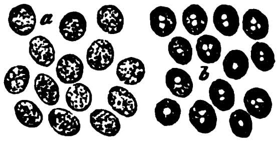


Fig. 16. *a*. Natural appearance of Pus-Corpuscles. *b*. Appearance after application of acetic acid.—Lehmann.

Fig. 17. Pus-Corpuscles, magnified 400 diameters.

These corpuscles float in the purulent liquor, but they are not the only solid elements observable. Purulent matter exhibits, besides these, granules, shreds of fibrin, and exudation-corpuscles of varying shape; also, at times, small homogeneous, non-nucleated corpuscles, termed "pyoid" by Lebert.

The mode of formation of these pus-corpuscles is still involved in obscurity. It is supposed by some pathologists that the grouping together of granules in the blastema forms a nucleus, and that a cell-wall becomes subsequently developed around one or several of these. Others maintain the opposite view, and regard the growth of a pus-corpuscle as gradual, from a very small vesicle up, the nuclei appearing last. Some of the most recent observers trace the pus-globules to a degeneration of the ordinary cells observed in coagulating lymph.

The corpuscles of pus may break up into masses of fine granules, or undergo fatty or calcareous degeneration. If these changes occur, various crystals, masses of cholesterine and oil-globules may be seen in the purulent fluid.

The *chemical* constitution of pus has been examined by a great number of experimentalists. The results of their investigation tend to show that pus contains most of the elements of the blood. The following analysis is by Gueterbock, from the pus of an abscess in the human breast.

| | |
|---|---|
| **Water** . . . . . . . . . | **86·1** |
| **Fat, soluble only in boiling alcohol** . . . . | **1·6** |
| **Fat and osmazome, soluble in cold alcohol** . . . | **4·3** |
| **Albumen, pyine, pus-globules, and granules, soluble neither in hot nor in cold alcohol** . . . . . . | **7·4** |
| **Loss** . . . . . . . . . | **0·6** |
| | **100·** |

Lehmann has investigated the chemical composition of the different elements of pus with great care. Normal pus he found to contain from 14 to 16% of solid constituents, of which from 5–6% belonged to mineral or inorganic substances. The most usual insoluble salts of pus are the phosphates of lime and magnesia, and the sulphate of lime; the principal part of the soluble salts is furnished by chloride of sodium. The quantity of fat in pus Lehmann found to vary from 2–6%; the quantity of albumen in the serum from 1·2 to 3·7%. Casein and the coloring matter of the blood do not occur in normal pus. A substance which usually enters into the composition of pus is *pyine*. Gueterbock, who discovered it, considers it a peculiar animal principle. Its exact nature is not understood. It is supposed by some to be an oxide of protein, by others a form of fibrin. It can be precipitated from pus by acetic acid, or by alum. It is soluble in water, but insoluble in alcohol.

With regard to the composition of the compound part of the pus-globules we possess no positive knowledge. The cell-walls, contents, and nuclei, react like protein bodies, and are probably of an albuminous nature. The cell-walls are dissolved by acids, but resist the action of alkalies.

*Varieties of Pus.*—Pus is liable to be modified in its properties by the presence of extraneous substances, such as grumous blood, fibrin, cholesterine, or the debris of the organs and textures in which it is formed. In common phlegmon, it often contains shreds of cellular tissue, of a dirty grayish color, not unlike wet tow. The brownish matter found in certain abscesses of the liver probably derives its color and consistence from the intermixture of the softened and broken-down hepatic parenchyma. In suppuration of the different glands, the pus is not unfrequently mingled with the product of their secretion. Thus, in the kidney, it may blend itself with the urine, in the liver with the bile, in the mamma with the milk, in the testicle with the semen. Purulent matter is sometimes very fetid, probably from the extrication of sulphuretted hydrogen.

The different varieties of pus have received different names. When the fluid is of a whitish color, creamy in its consistence, and composed of a great number of globules, it is said to be *healthy*, pure or laudable, in reference to the process by which it is produced, which is of a healthy, sanative, or restorative nature. It is usually met with in suppurating wounds, in healing ulcers, and in acute abscesses. Its properties have been already sufficiently described.

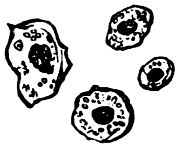
*Sanious*, serous, ichorous, or sanguinolent pus is thin, almost transparent, and of a yellowish, oily, or reddish color, and is generally so acrid as to erode the parts with which it comes in contact. It is a product of unhealthy inflammation, and is principally observed in caries of the bones, in irritable ulcers, and in open cancers. This variety of pus is frequently blended with grumous blood, flakes of fibrin, and the debris of the affected tissues.

*Fibrinous* pus consists of common pus in combination with plastic lymph. It is of a whitish, grayish, or cineritious color, and of a semi-liquid, concrete, or lardaceous consistence. Under the microscope, it displays the globules of healthy pus, with numerous other cells and fibres of irregular shape. It is commonly found in the joints, the splanchnic cavities, in metastatic abscesses, and in carbuncular inflammation. Its presence denotes a high degree of morbid action.

*Scrofulous* pus is mostly seen in pulmonary caverns, cold abscesses, scrofulous disease of the joints, and chronic inflammation of the lymphatic ganglions. It usually separates into two parts, of which one is thick, straw-colored, and inodorous; the other thin, ropy, and mixed with small, opaque, curdy flakes. When scrofulous pus is long retained it may acquire a disagreeable, nauseous smell, not unlike the pollen of the chestnut; at other times it is excessively fetid. The attendant action is usually very languid.

There is a variety of pus to which, owing to its admixture with mucus, the term *muco-purulent* is applied. It is usually a product of a high degree of inflammation of the various outlets of the body, particulary the nose, eye, bronchial tubes, and genito-urinary apparatus. The mucus which proceeds from these surfaces in the healthy state is composed of a transparent fluid, and of abraded epithelium cells, flat, and irregularly sided, with a central nucleus. In addition to these, the microscope detects numerous granular masses and spherical globules, similar to those of pus; the whole being suspended in a viscid, transparent, ductile fluid. These different appearances are well depicted in Fig. 18. Under inflammation, the epithelium cells are cast off so quickly that they have not time to become flattened out, and the globules are not only greatly augmented in number, but they acquire somewhat of the character of those of pus.

Fig. 17.



Mucous pus-globules.

Certain kinds of pus are *contagious*. Of this description is the matter of smallpox, varioloid, gonorrhœa, and chancre. In what particular element of the fluid the virus or specific secretion is contained, or whether it exists as an entity, is undetermined. The vitality of the organ by which it is elaborated is not necessary for the preservation of its peculiar effects. Once secreted, it becomes independent of its source, and retains, for a considerable period, the power of contaminating the parts to which it is applied, producing a disease of the same character. Various chemical agents, however, as the alkalies and acids, have the property of neutralizing or destroying it, so that, if inoculation be afterwards attempted, no effects will follow. If the pus of a chancre be examined with the microscope, it will often be found to contain animalcules, particularly the vibrio lineola.

Pus is merely an altered state of the blood, the product of a peculiar secretion, not unlike that in kind, though more intense in degree, which is concerned in separating the nutritious elements from the vital fluid. How it is deprived of the coloring matter it is not easy to determine; it is one of those hidden and mysterious circumstances, concerning the efficient cause of which it would be absurd to speculate. Nor is it easy to establish whether the secreted fluid undergoes the peculiar change which gives to it its purulent character, inside or outside of the vessels. Gendrin believes the change to take place in the blood-globules within the vessels; some modern pathologists, however, regard the metamorphosis as due to alterations of the elements of exuded lymph.

*Tests.*—Various attempts have been made to discover some test by which pus might be distinguished from other secretions, especially from mucus, which it is known to resemble more closely than any other. An ingenious test was proposed by Dr. Young, of England. It is founded on the globular particles of the fluid, and consists in putting a portion between two pieces of plate glass, holding it near the eye, and looking through it at a distant candle. If the matter be purulent, it will be encompassed by a bright halo of colors, not unlike those of the rainbow, the light being at the centre, and the tints so much the more intense as the particles are more numerous and more equably diffused. Gueterbock, who has examined this fluid with great care, finds the only distinction between it and mucus to be, that the pus-globules always sink in water, while the mucus floats. A test more accurate is the agitation of the suspected fluid with liquor potassæ. If it be pus, a dense gelatinous mass is formed. Again, the serum of pus is highly albuminous, mucus is not. Finally, mucus treated with acetic acid coagulates into a thin membranous formation; pus does not: treated with ether, mucus yields mere traces of fat, while this principle may be extracted from purulent fluids in considerable quantities.

Much has been said about the difference between the mucus-corpuscle and pus-corpuscle. But no such difference exists in reality. Perfectly healthy mucus contains no corpuscles, and it is only when the mucous surfaces have become irritated or inflamed that corpuscles are observed in the viscid fluid. These corpuscles are undeveloped epithelial cells, lymph-corpuscles and pus-corpuscles; in fact, they are the products of the morbid action. The so-termed increased mucous secretions, the result of irritation, are thus, in reality, more or less muco-purulent; an admixture of ropy mucus with the elements of inflamed membranes. The distinctions, therefore, between mucus and pus, formerly so much dwelt upon, have lost most of their practical value.

# CHAPTER V.

## HEMORRHAGE.

**The subject still involved in obscurity.—Causes.—Opinions of Morgagni and Bichat; Exhalant Vessels.—Aptitude of different Structures.—Nomenclature.—Predisposition.—Hereditary Proclivity.—Hemorrhage sometimes vicarious.—Active and passive.—Critical.—Quantity of Blood effused.—Changes and final Disposition.**

In the pathology of hemorrhage there is much that remains to be elucidated. This is not surprising, when we consider the ignorance which still exists in relation to the capillaries in which this lesion is, for the most part, located. We have no means, except by analogy and induction, of ascertaining the habits, if I may so express myself, of these small tubes whilst engaged in the discharge of their various functions. We are acquainted, however, with certain facts, and these, scanty as they are, must guide us in the discussion of the subject.

Although inflammation is not unfrequently attended by a discharge of blood, this is by no means the only condition in which this phenomenon is observed. In many instances it would seem to be the result purely of over-distension of the capillaries, from obstruction in the heart or large vessels, by which the sanguine fluid is prevented from pursuing its accustomed route with its accustomed freedom. It is not necessary, however, in order to bring about this congestion, that the system should be in a state of plethora; most commonly, indeed, the reverse is the case, the quantity of blood being unusually small. In some diseases, again, such as scurvy and typhus, in which hemorrhagic effusions are by no means infrequent, it is exceedingly probable that the blood itself is morbidly affected, by which it is enabled the more readily to percolate through the relaxed parietes of the minute vessels, carrying with it its different component elements.

Formerly the idea prevailed that all sanguineous effusions invariably depended upon rupture of the bloodvessels. Nor is this notion, even at the present day, fully eradicated from the minds of some physicians and pathologists. Morgagni seems to have been the first to throw out the hint that hemorrhages might be the result merely of a process of exhalation, without the slightest appreciable lesion of the vessels from which it emanates. This opinion, so well calculated to elucidate this interesting piece of pathology, was afterwards embraced by Bichat, who has fully discussed it in his great work on the tissues. He explains the phenomenon through the instrumentality of a set of open-mouthed vessels, known under the name of the *exhalants*. Of these he has described not less than three distinct orders, the excrementitious, nutrient, and recrementitious. The existence of such vessels was long ago admitted by Boerhaave and Haller; and, since their time, they have formed a favorite subject of speculation with many highly respectable anatomists. Unfortunately, however, much labor has been wasted which might have been turned to more profitable account; for it is now well known that there are no exhalants, in the true sense of that term; none, at all events, have ever been demonstrated.

How, then, if the open-mouthed vessels, so minutely described by Bichat and others, have no existence, are we to explain the exhalation of blood? Are we to suppose, with Mascagni, that the arteries are everywhere furnished with pores through which the contained fluids merely percolate? That there are apertures in the tunics of the vessels, of some kind or other, is a circumstance concerning which there can no longer be any dispute. It has been satisfactorily proved by experiments, repeated a thousand times, and modified in every possible way, that all animal tissues are permeable to fluids and gases; which could not be the case if they were destitute of pores. What the nature of these openings is, it is not my design to inquire, nor is it material that it should be known. The fact that they exist is sufficient for my purpose.

Assuming, therefore, that all vascular canals are porous, the most plausible theory that suggests itself is that all hemorrhages, not dependent on rupture, are caused by a sort of endosmose, diapedesis, or transudation, by which the elements of the blood are forced through the coats of the vessels, and made to occupy situations in which they are not naturally found. The process, however, is not a mechanical, but a vital one, and consequently very different from the transudation of the blood which takes place after death from decomposition. How far this process differs from that of ordinary secretion, or what the precise conditions are on which it depends, are circumstances which it is not in our power to explain. Analogically, it may be inferred that the vessels are in a state of morbid activity, whereby fluids are suffered to escape that were appointed to be retained; or it may be supposed, as we have reason to believe is often actually the case, that the capillaries, being in a state of debility and relaxation, have their pores rendered unnaturally patulous, and thus allow the blood to have a more ready egress. Nor is it probable that the change, whatever it may be, is confined to the minute vessels. To give rise to the phenomenon in question, the nervous system must be involved, so as to promote, if not excite, the perverted action. The idea of Morgagni and Bichat, that hemorrhage proceeds from exhalation, embraces no error, other than that it ascribes this process to a set of vessels which, so far as is at present known, have no real existence. In all other respects, the term exhalation expresses the same thing as that of exosmose, transudation, oozing, or diapedesis.

The theory propounded by Morgagni and Bichat will not appear so difficult, if we take into account the results of some recent experiments in relation to the subject of venous absorption. The doctrine that this function is exclusively executed by the lymphatics, has been completely subverted by the researches of Magendie and other physiologists. If, then, it be admitted, as certainly it must, that the veins absorb or imbibe fluids, it does not require much stretch of the imagination to conceive that the arteries, which so much resemble them in structure, should exhale blood, especially when they are in a state of disease. This process, indeed, takes place, apparently, even within the limits of health, as in the uterus, where it constitutes the menses.

Having made these remarks, it may now be stated that, so far as the immediate causes of hemorrhage are concerned, it may result, first, from exhalation: and, secondly, from direct injury of the vessels. In regard to the former of these divisions, enough has been said to render it unnecessary to add anything more in this place; as respects the latter, I shall only observe, that the most frequent source of hemorrhage is a rupture of the vessels, in consequence of disease of their tunics, or from the violence with which the blood is impelled into them by the action of the heart or by extraneous force.

*Liability of different Structures.*—The structures in which hemorrhage is most frequently observed are the mucous, the cellular, and the serous. Almost every organ and texture of the body, however, is liable to be thus affected. Of the mucous system, some portions are much oftener involved than others. It is asserted by some that all parts of the alimentary tube are equally subject to this effusion, which, however is a mistake. Beyond all doubt hemorrhage is most common in the large bowel; next, in point of frequency, in the stomach; and, finally, in the inferior third of the ileum. The jejunum and duodenum, together with the œsophagus, mouth, and fauces, are rarely affected. A discharge of blood from the nose and bronchial tubes is not an infrequent event, while it is very unusual in the larynx and the trachea. In regard to the genito-urinary division of the mucous system, considerable difference obtains in the two sexes. In the male, the urethra and bladder are oftenest involved; in the female, the uterus and vagina.

Of the serous membranes the parts most liable to sanguineous effusion are the pleura and pericardium. The cutaneous texture is very rarely affected, except in scurvy and typhus fever. With regard to the viscera, the brain and lungs are much oftener the seat of hemorrhage than any other. Indeed, it is doubtful whether some of them, owing to the peculiarity of their structure, are susceptible of this lesion. Be this as it may, effusions of blood, whether from rupture or otherwise, are exceedingly uncommon in the liver, spleen, kidney, pancreas, uterus, ovary, and testis. In the fibrous, cartilaginous, ligamentous, and osseous textures, they seldom, if ever, occur.

Eruptions of blood have received different names, according to the parts in which they occur; but these it is not necessary to specify. They have sometimes been described under the term *apoplexy*. This word was originally restricted to hemorrhagic effusions of the brain: at the present period, however, it is employed in a wider sense, being applied to all extravasations of blood, no matter where occurring.

*Causes.*—The predisposition to hemorrhage in different organs varies remarkably in the different periods of life. During childhood epistaxis is most common; between twenty and thirty-five, there is an extraordinary proclivity to hemorrhage of the lungs and rectum; about the age of forty, bleeding of the uterus is most usual; from fifty to sixty, apoplexy and hæmaturia are most frequent, especially in men of irregular, dissolute habits. The exciting causes of hemorrhage are extremely numerous, but, as they do not particularly concern the pathological anatomist, they need not be enumerated here. A plethoric state of the system, especially in the young, and a nervo-sanguineous temperament, are circumstances which powerfully predispose to its occurrence. Climate also appears to determine some difference in the eruption of blood in different situations. In cold regions, for example, hemorrhage is most frequently observed in the nose, bronchial tubes, and urinary bladder; in tropical, in the rectum and uterus. It is also supposed to be more common in the female than in the male; but upon this subject we have no positive information.

*Hereditary.*—One of the most remarkable circumstances in the history of this lesion, is its hereditary tendency. The facts which are in our possession, in relation to this subject, are too numerous and well authenticated to admit of the slightest doubt, in the mind even of the most skeptical. Almost every practitioner must have noticed cases of this description. Dr. Krimer, a German physiologist, records a curious instance in which this hereditary proclivity displayed itself in the male descendants of a family in four successive generations; and two similar cases have been reported by Dr. J. N. Hughes, of Kentucky.[1] What is more singular than all, is, that the disease may cease in one generation and reappear in another. In a most remarkable case of this mode of transmission, mentioned by Dr. Riecken,[2] the parents, who both attained to old age, had never been subject to hemorrhage. The couple had twelve children—five boys and seven girls—of whom three of the former and one of the latter died of the lesion in question. The youngest daughter, who never suffered from the affection, married a stout, healthy man, by whom she had six children—four boys and two girls; two of the former of whom fell victims to hemorrhage.

*Vicarious.*—Not less singular is that variety of hemorrhage to which the term vicarious has been applied. As its name imports, it is supplemental of a similar natural or morbid state in a remote organ, and is most frequently observed in young females, in consequence of the tardy appearance of the menstrual flux, or of its suppression after it has been established. In the great majority of cases, it is located in the mucous membrane of the nose, and recurs with considerable regularity every lunar month, until the obstruction, of which it is the result, has subsided. Occasionally the blood oozes from the skin, the eye, ear, lung, anus, umbilicus, and even the nipple, either simultaneously or successively. What particular changes, if any, the capillaries, which are the seat of these vicarious effusions, undergo, is not ascertained: we only know that they are the chief agents which are concerned in their production: beyond this all is doubt and uncertainty. That they are effected under the immediate influence of the functional operation of the minute vessels, as has been suggested by some, appears not improbable; but this, I apprehend, does not explain the matter, or bring us any nearer to the truth than we were before.

---

[1] Transylvania Journal of Medicine, vols. iv. and v.

[2] Edinburgh Medical and Surgical Journal, No. 108; also, Cyclop. Pract. Med., vol. i. p. 480.

*Classes.*—Hemorrhages are usually divided into two classes, the active and passive; the former occurring in strong, robust persons, the latter in such as are naturally feeble, or who have become so by disease, impoverished diet, or excessive evacuations. This distinction, however, is not of much value in a practical point of view, as it is often extremely difficult to refer the cases that are met with to the one or the other of these forms; nor is it of any importance in reference to the proximate causes of the disease, inasmuch as they are usually the same in both varieties. Again, hemorrhages have been divided into acute and chronic; an arrangement which is, perhaps, on the whole, the less objectionable of the two.

Hemorrhages are not always announced by precursory symptoms. In some cases the individual experiences obscure pains in different parts of the body, with a sensation of weight and fulness in the organ from which the effusion is about to occur, and chilliness of the extremities, particularly the feet. The blood, which often escapes with great rapidity, oozing out at innumerable points, is generally of a florid hue, and, although it readily coagulates, seldom separates into serum and crassamentum, as when it is drawn from a vessel at the arm.

Sanguineous effusions sometimes occur as a *critical* discharge, especially in cases of protracted fever. Nature, in such cases, seems to make an effort to get rid of the original disease, by establishing an efflux in some remote part, which, in most instances, is the nose. Nevertheless, as the occurrence is not constant, it can be regarded in the light merely of an accidental circumstance, produced by some disruption in the balance of the circulation.

The quantity of blood varies, in different cases, from a few drops to several quarts. Generally speaking, it will be likely to be much greater when it proceeds from the rupture of a vessel than when it is the result of exhalation. In no part of the body is hemorrhage so apt to be profuse as in the mucous system. In the uterus, the bronchial tubes, the stomach, and intestines, an immense quantity of blood is frequently discharged in the course of a few minutes.

*Changes in the Effused Blood.*—When blood is effused, one of four circumstances happens in regard to its final disposal. In the first place, it may be entirely rejected, as generally happens when the hemorrhage occurs in the œsophagus, the stomach, or bowels. In all these situations, as well as in the urinary, genital, and respiratory passages, the blood is voided either in a pure state, or blended with such substances as may happen to be lodged there at the time. Secondly, the fluid may be absorbed. This frequently takes place in the subcutaneous cellular tissue, and sometimes, also, in the brain, lungs, and other viscera. Thirdly, the blood may remain, and become organized; or, fourthly, it may act as a foreign substance, and induce fatal inflammation.

The above account would be imperfect were we to pass by the changes which are wrought in the color and consistence of the effused blood. When it is poured into the pulmonary organs, it is usually quite fluid, and of a bright florid hue, from the influence of the atmosphere. In the stomach, on the contrary, it is generally more or less coagulated, and of a black color, from the action of the acid and gaseous contents of the organ. In most of the other viscera, properly so termed, it is of a dark complexion, and, for the first day or two, of a fluid consistence. Subsequently, by the action of the neighboring absorbents, the coloring and serous portions of the blood are, in great measure, removed, and the consequence is that it not only becomes lighter but likewise more dense and firm. At a still more remote period, the clot becomes organized, and not unfrequently also encysted. To these important changes, with which every one should be acquainted, we shall revert when treating of cerebral apoplexy, a disease in which they are generally most conspicuous.

## CHAPTER VI.

### SOFTENING.

ONE of the most singular effects of inflammation is softening of the affected parts. The term which is here used to designate it is synonymous with that of mollescence, so much in vogue among the French pathologists. Next to redness, softening may be regarded as decidedly the most unequivocal sign of the existence of phlegmasial irritation.

Softening does not occur with equal frequency in all the organs and tissues of the body, yet there is perhaps not a single one that is not sometimes affected with it. The parts in which it is most common, as well as most strongly marked, are the brain, the spinal cord, the mucous membrane of the alimentary tube, the spleen, and liver. It is occasionally seen in the tendons and cartilages, where it forms the principal, if indeed not the only, character of inflammation, both the redness and turgescence being, in most cases, entirely wanting here. The bloodvessels, the serous and fibrous textures, the ligaments, the voluntary and involuntary muscles, and the external teguments are among those parts of the body which are least liable to be affected with this disease, owing, no doubt, to the peculiarity of their nervous and vascular endowments. In the bones, softening is by no means uncommon, and may pervade nearly the entire skeleton. When this is the case, the other organs and textures of the body usually participate in the lesion, although so slightly, perhaps, as to be scarcely observable in making the dissection.

The interesting question here arises—what is the particular anatomical element in which the lesion now under consideration resides? As might be expected, observations have been made with a view of deciding this point, and the result would seem to be, that, in nearly all cases, the structure most at fault is the interstitial cellular. In the liver, for example, the diminution of cohesion is never so strongly marked in the granulations as in the cellular substance by which they are surrounded. So likewise in the muscles, the fleshy fibres frequently retain their healthy consistence long after the connecting tissue is converted into a soft shreddy mass. In the stomach and bowels, also, the mucous membrane is never softened by inflammation without the cellular structure beneath participating in it. These changes are, probably, brought about by a degeneration of the effused lymph and of the tissues themselves. If the softened part be examined with the microscope it will be found to consist of granules, either diffused or amalgamated in masses, and of the debris of the softened organs.

The most common cause of softening, as has been already stated, is inflammatory irritation, generally acute, but sometimes of a slow, chronic, character. It may also be the result of causes which exert their influence after death. In making examinations, nothing is more common than to find the posterior parts of the lungs much softer than the anterior, simply, it would appear, from the stagnation of the blood; and, in the stomach, mollescence, it is well known, is frequently produced by the action of the gastric juice. These facts should be borne in mind by the pathologist; otherwise he will be in danger of confounding these phenomena with such as are caused by inflammation. There is a species of softening, particularly frequent in the brain and spinal cord, supposed to proceed from ossification, obliteration, or mechanical obstruction of the arteries. That mollescence may be brought about in this way is fully established; at the same time it must be confessed that it is far from being certain, that, when the nutrition of an organ is thus interrupted, the changes which it experiences are not of a character which assimilate it to inflammation. This opinion will not appear implausible when it is recollected that there is always more or less effusion of serosity, of lymph, or even of purulent matter. There can, indeed, strictly speaking, be no such thing as dry softening; and whenever, therefore, the fluids here referred to are found, there is reason to believe that they are poured out as an effect of inflammatory irritation.

The degree and consistence of a softened organ cannot be very well defined in a general way, and the consideration of it must, therefore, be postponed until we come to speak of mollescence of individual structures. In its color it may vary from a milky white, as in the brain, to deep red, as in the lung, with every intermediate shade of ash, brown and yellowish. What is singular, the bloodvessels in many cases seem as if they had entirely disappeared, whilst in others they are so weak as to be incapable of withstanding the slightest pressure, or receiving the finest injection.

# CHAPTER VII.

## GANGRENE.

GANGRENE, mortification, or sphacelus, which I shall use as synonymous terms, may be defined to be the extinction of the vitality of a part of the body, the rest of the organism retaining its life. When this event is about to take place, the affected structure loses its sensibility and temperature, the blood ceases to circulate, and all its other functions are suspended. The process by which these changes are accomplished is generally progressive, its rapidity varying with the constitution of the patient, the violence of the exciting causes, and, above all, the nature of the suffering structure. Thus, gangrene, in some cases, takes place in the course of a few hours, whilst, in others, it does not make its appearance for several weeks or months from the commencement of the inflammation.

Much diversity prevails amongst the different organs and tissues in regard to their *liability* to become affected with this lesion. The cellular, cutaneous, and mucous may be enumerated as the textures which are more frequently seized with mortification than any other; and it is worthy of remark that these are parts which are extremely well supplied with blood, especially the two latter. Nevertheless, in the skin and cellular substance, this event takes place most frequently in situations which are remote from the central organ of the circulation, as on the hands, feet, and posterior portions of the trunk. In the mucous system, the parts most liable to mortification are the gums, the inside of the cheeks, the tonsils, the colon, the inferior third of the ileum, the urinary bladder, and the lining membrane of the vulva. The serous membranes, muscles, ligaments, tendons, aponeuroses, and cartilages are rarely affected; and the same remark holds good in reference to the arteries, veins, and absorbents. The three latter of these structures, indeed, possess a most astonishing conservative power, and hence it is not uncommon to find them retain their integrity in the midst of the sphacelated part. In malignant scarlet fever, attended with mortification of the tonsils and upper part of the neck, I have seen the common carotid continue in the performance of its function, and the individual recover, notwithstanding the detachment of immense sloughs of the skin and cellular substance; and similar phenomena have often been witnessed in gangrene of the inferior extremities.

It seems doubtful from the cases on record whether sphacelus has ever been actually observed in the uterus, kidneys, ovaries, suprarenal capsules, the thyroid body, the testicles, pancreas, and salivary glands. The occurrence, at any rate, is extremely rare, and further observation is necessary to settle the question. Gangrene of the lungs is by no means so uncommon as was formerly supposed; it is also sometimes observed in the liver and spleen, and, more rarely, in the brain and spinal cord. The nerves are seldom affected; the heart, perhaps, never, although cases have been recorded in which the reverse is said to have been true. The bones are often destroyed by gangrene, especially those of the inferior extremities, from causes which seem to be originally seated in their own structure, or in the fibrous membrane which surrounds them.

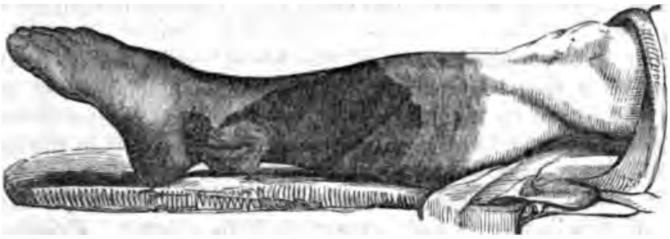
The *color* of the mortified part varies with the nature of the affected tissue. In the lungs it is frequently greenish, black in the spleen, cineritious in the cellular tissue, livid in the skin, brownish or pale yellow in the mucous membranes, and like the lees of red wine in the brain and spinal cord. This statement, of course, is liable to numerous exceptions, to which particular reference will be made in their appropriate places. Ligaments, tendons, and fibrous membranes rarely undergo much change of color, unless there is at the same time an abundant effusion of sero-sanguinolent fluid, in which case they occasionally have a reddish, macerated appearance.

It need scarcely be remarked that the *consistence* of a mortified part must depend, in great measure, upon the mode of aggregation of its anatomical elements, and upon the amount of blood by which they are nourished. In gangrene of the lung, which contains a large quantity of cellular substance, pervaded by myriads of the finest capillaries, the affected part is generally very soft—sometimes, in fact, a mere diffluent putrilage—in which it is impossible to discern the slightest trace of the primitive structure of the organ. Nearly similar phenomena are occasionally observed in gangrene of the brain, spleen, and liver. In mortification of the cellular tissue, especially in the carbuncular variety, the loss of cohesion is likewise very considerable; so that this substance can be torn and cut with much more facility than in the normal state. The harder solids, as they are denominated, on the contrary, undergo very little change of consistence, as is exemplified in tendon, ligament, and bone.

Much of this loss of cohesion is owing to chemical decomposition. The period at which this begins is greatly influenced by the structure of the affected part, the quantity of effused fluid, the season of the year, and the nature of the dressings. There are several species of gangrene, where the affected part is perfectly dry, hard, and shrivelled, approaching to the condition of a rotten pear. In other cases the mortified mass is remarkably soft and boggy, exuding, on being divided, a large quantity of thin, turbid, sanious matter. It is on the absence of this fluid, on the one hand, and on its presence, on the other, that is founded the distinction, made by some writers, into dry and humid gangrene. The exhalation which arises during the progress of the decomposition, and which gives to gangrene its characteristic fetor, has not, I believe, been thoroughly investigated by any chemist; probably it is of the nature of hydrogen gas, holding in solution a certain quantity of carbon, sulphur, and phosphorus.

Gangrene may affect a single tissue, or appear simultaneously in a considerable number. This latter occurrence is well-exemplified in severe inflammation of the lower extremity, Fig. 19. Commencing in the subcutaneous cellular tissue, it gradually extends to the skin, the aponeurosis, muscles, periosteum, and bones, which, together with the vessels and nerves, it sometimes converts into one common sphacelated mass, of a dark livid color. In a case of this description, should the patient's constitution be good, the gangrene, after having proceeded a certain distance up the limb, manifests a disposition to stop, or, more properly speaking, the surrounding structures make an effort to resist its further encroachment. This attempt is generally indicated by the appearance of a red line, for which the surgeon always anxiously looks, as it forms a circumvallation around the dead parts, and shows that the morbid action is arrested. The next step which nature takes in the enterprise is to set up ulcerative action, by which the mortified mass, now called a slough, is gradually detached, the structures that give way first being the cutaneous and cellular, then the muscular and fibrous, then the nervous and vascular, and finally, the ligamentous and osseous. The action by which this important change is effected is confined exclusively to the living parts, and the rapidity with which it takes place is influenced by a great variety of causes, which it would be needless here to enumerate.

Fig. 18.



Gangrene after compound fracture; still spreading; no line of demarcation.

One of the most interesting phenomena, in connection with this sloughing process, is the manner in which nature guards against the occurrence of hemorrhage. Long before death has accomplished its work, the blood in the vessels of the affected limb begins to coagulate, and, by the time the parts are ready to be detached, the inspissated fluid is firmly glued to the inner surface of the tubes by adhesive inflammation. The arteries and veins, however large, are thus, as it were, hermetically sealed, so that, on amputating the limb, particularly when the plug extends high up into the sound parts, there is frequently not the slightest hemorrhage.

*Causes.*—The causes of gangrene may be divided into two great classes, into those, namely, which act directly upon the part, and those which exert their deleterious influence through the constitution. Of the former, it is not necessary to say anything here, further than that they are either of a mechanical, chemical, or physical character: of the latter, however, as they involve some highly interesting circumstances in relation to the operation of internal poisons, it will be proper to give a more comprehensive account.

Among the internal causes of gangrene, are organic diseases of the heart, leading to deficient circulation in remote parts of the body, imperfect supply of the nervous influence, habitual intemperance in eating and drinking, want of nutritious diet, and the inordinate use of spurred rye.

That an impoverished state of the blood, with lesion of the innervation, is a frequent cause of gangrene, is a fact which is now generally admitted by medical men. In the lower orders of society, mortification from this source sometimes manifests itself in the mucous membrane of the mouth and vulva, in the groin, axilla, and feet. The influence which a diseased state of the blood exercises in the production of this lesion is well exemplified in scurvy. Persons who labor under this affection are extremely prone to inflammation from the slightest accident, frequently followed by gangrene. The exhaustion, also, which exists during protracted fevers, is well known not only to favor the development of inflammation, but to give this disease a peculiar tendency to mortification.

Malignant pustule, as it is termed, a disease which is not uncommon in certain provinces of France and Germany, and which will be noticed more particularly hereafter, seems to be often produced by causes which exert their influence through the medium of the circulating fluids. In the experiments of Hamont and Leuret, blood taken from the veins of an affected animal and transfused into those of a sound one, readily induced this singular malady. Even the flesh appears to be strongly impregnated with the septic agent, numerous examples being on record where death was occasioned by using it as food.

There is a species of gangrene which is very rare in this country, but sufficiently common in certain districts of France, Switzerland, and Germany, where it sometimes prevails endemically. Many of the inhabitants of these countries, it is well known, use rye almost exclusively as an article of food. In very moist seasons, this grain often contains a large quantity of blighted matter, which has received the name of *ergot*, secale cornutum, or cock-spur, and which, when employed for a considerable length of time, is supposed to give rise to the disease in question. The attention of the profession was first called to this affection by M. Dodard, a French physician, in 1676: it was examined with considerable accuracy by M. Noel, surgeon to the Hôtel Dieu, of Orleans, and has since his time been frequently made the subject of investigation; but for the latest and most correct account of it we are indebted to M. Tessier.

This species of gangrene is, in every respect, a most singular affection. In the cases described by M. Noel, it always began in the toes, whence it gradually extended along the foot and leg, until, in some instances, it reached the upper part of the thigh, or even the trunk. In the majority of the patients, the gangrene was preceded by redness, pain, and burning heat, which subsided, in the course of four or five days, leaving the parts cold, hard, dry, insensible, and as black as charcoal. After some time, sloughing commenced, and, if the system was not too much exhausted, nature alone was frequently sufficient to effect the separation of the affected limbs. In one of the cases, both thighs were detached at the ileo-femoral articulation.

In a second series of cases, delineated by Gassoud, the disease is described as occurring in the feet, legs, hands and arms. The symptoms which accompanied it varied in different individuals. In some, there was considerable swelling, with great pain and heat; in others, the tumefaction was combined with redness, and the patient labored under fever and delirium; in others, again, the suffering was entirely local, and was sometimes intermittent, sometimes constant. The separation of the black mortified mass commonly took place spontaneously, and was often attended with the most excruciating pain. Neither in these, nor in the cases mentioned by Noel, was there any of the fetor which is so generally present in ordinary gangrene. M. Bossau, however, met with some instances of this affection in which the parts exhaled an insupportable stench; but it is worthy of remark that, in most of them, the gangrene was not of the dry kind. The disease, it would seem, attacked, indiscriminately, men, women, and children.

For a long time doubts were entertained whether ergot was really the cause of this disease. With a view of settling this point, M. Tessier, an eminent French physician, was requested by the Royal Academy of Medicine of Paris to investigate the matter experimentally. The subjects of his researches were ducks, turkeys, and pigs. Without going into details, which would be foreign to my design, it may be briefly stated that these animals were rigidly subjected to the use of spurred rye; that most of them died between the tenth and twenty-fourth day; and that distinct marks of sphacelus were perceived in different parts of the body, both externally and internally.

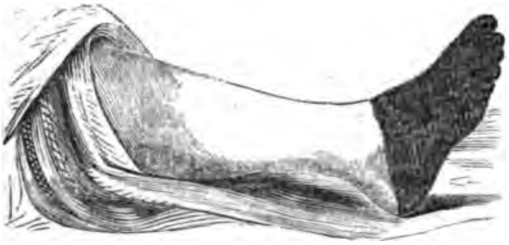
How, it may now be asked, does ergot operate so as to produce this singular effect? On this point we are still in complete ignorance. The only idea I can form of the influence of this substance is, that it exerts its deleterious impression, in the first instance, upon the blood, and, through it, upon the capillaries, causing inflammation in them, followed by gangrene. This opinion, indeed, seems to be fully borne out by the phenomena which precede this event, not only in the human subject, but likewise in the inferior animals. That the blood and its vessels are alone implicated, is not probable: the nervous system is, no doubt, also seriously involved: all that is contended for is, that these are the parts which receive the primary impression, whatever that may be.

A remarkable case of gangrene of all the extremities, resembling mortification from ergotism, occurred in this city in 1855, in the practice of Dr. Bernard Henry, in a female forty-two years old, the mother of nine children, of intemperate habits, and formerly the subject of syphilis. The disease was preceded by pain and stinging sensations in the hands and feet, which, together with the tip of the nose and the skin over both patellæ, became gradually black, cold, dry, and shrivelled, the mortification extending finally beyond the middle of the arms and legs. There was no ossification of any of the arteries, and the principal lesion seemed to be contraction of the left auriculo-ventricular orifice.

This form of gangrene is sometimes seen in the inferior animals. In Chester County, Pennsylvania, it prevailed extensively among the horned cattle in 1819, and, in the following year, in Orange County, New York. In these instances the disease seems to have proceeded from the use of the *green grass*, the poa viridis, the seeds of which were affected with ergot.[1]

It is a curious fact that violent vomiting and purging, induced by drastic cathartic medicine, will sometimes give rise to a bad form of inflammation, rapidly followed by gangrene. The parts most liable to suffer in this way are the nose, ears, lips, cheeks, chin, toes, and fingers; those outskirts of the body which do not possess a very active circulation, especially in persons of a feeble constitution, or impaired health. The mortification is generally preceded by severe pain, and by deep purple discoloration of the affected surface.

Fig. 19.



Senile gangrene of the foot.

Closely allied to the disease now described is *senile gangrene*, or mortification of the toes and feet, so ably portrayed by Mr. Pott, of England. Occurring most commonly in old persons, it is met with at all periods of life, sometimes even as early as the third year. Both sexes are liable to it, but males suffer more frequently than females, probably because they are more intemperate and exposed to greater hardships.

Senile gangrene is generally slow and insidious in its origin, commencing sometimes without the slightest pain, uneasiness, or swelling. The lower extremities, especially the feet and legs, are the parts of the body most frequently involved in its progress. The hands and arms may also suffer; but it is rare that the nose, ears, lips, cheeks, and trunk are implicated. When the disease affects the lower limb, it generally makes its appearance first on the inside of one of the smaller toes by a circumscribed bluish spot, which is more or less painful, and is soon followed by a separation of the cuticle, leaving the skin beneath of a dark red color. In some instances the gangrene begins at a number of points at once, and when this is the case it is usually more rapid in its march, as well as accompanied with more urgent symptoms. In its progress, it gradually involves the whole foot, and not unfrequently the leg, and even the thigh, the soft parts of which are converted into a black, bluish, or brownish mass, often extremely offensive to the smell. The sloughing process generally goes on rapidly, and the bones occasionally drop off at the joints.

---

[1] Domestic Encyclopedia, vol. ii. p. 52, and vol. iii. p. 196.

The cause of this variety of gangrene is ossification of the arteries, with inflammation of their lining membrane leading to an effusion of plastic matter, and the formation of coagula, fibrinous concretions, and other extraneous products in their interior. A mechanical obstruction is thus occasioned, which embarrasses, interrupts, or totally suspends the circulation of the affected part, and gives rise to the cold, dry, withered, and mummified condition which characterizes the disease. The obstruction, there is reason to believe, usually commences in the capillaries, from which it gradually extends to the larger vessels. How the inflammation which precedes and accompanies the obstruction originates, is not determined. The predisposing causes are various; but are referable mainly to organic disease of the heart and great vessels, vitiation of the fluids, particularly the blood, and impairment of the vital powers.

# CHAPTER VIII.

## ULCERATION.

**Definition; intricate Nature—Most common in the Skin, Cellular Tissue, and Mucous Membranes.—May be slow or rapid.—Manifests a tendency to extend towards the nearest surface.—Produced by Inflammation.—Influenced by an impoverished state of the Blood.—Ulcers sometimes heal; the process by which this is accomplished.—Ulceration a sanative effort.**

ULCERATION may be defined to be the molecular death of a part, or mortification in miniature, attended with the disintegration and gradual removal of the affected parts. It is synonymous with what was anciently called erosion, and with what some modern pathologists denominate ulcerative absorption. Of the intimate nature of this lesion nothing is known with any certainty, beyond the fact that it is essentially connected with inflammation.

Although there are few parts which are not susceptible of ulceration, yet that this occurrence is much more frequent in some textures than in others, is a fact of which every one is convinced by daily observation. The cutaneous, mucous, and cellular tissues are much more frequently affected than all the rest put together. This is well exemplified in the numerous blotches which so often cover the body, and in the erosions which are so frequently noticed in the bowels, mouth, throat, vagina, and larynx. The heterologous formations, the bones and teeth, with the articular cartilages and their synovial coverings, come next in order. The serous membranes, properly so called, the fibrous and muscular structures, rarely suffer from ulceration; and the same is true of the internal viscera, excepting the uterus. Nature seems also to have endowed the vascular system with a remarkable power of resisting this process. Vessels, even of large size, are occasionally completely exposed from the destruction of the surrounding parts, and yet entirely escape the disease.

It is remarkable that parts even of the same structure will take on ulceration much more readily in some situations than in others. This is well exemplified in the digestive mucous membrane. Thus, for one erosion in the stomach, we find at least a thousand in the ileum and the colon; and so also, though not in the same ratio, with the skin of the upper as compared with that of the lower extremity. Newly-formed parts are extremely prone to ulceration. A cicatrice is rapidly destroyed by this process, because it is much more feebly organized than structures that have existed longer. The same thing happens in the callus of a fractured bone.

Ulceration occasionally proceeds with great rapidity, destroying as much of the body in a few days as nature can repair in as many months. It is sometimes limited to one texture; at other times invades a considerable number. In the bones, although it usually progresses very slowly, it is often remarkably destructive, whole pieces of the skeleton being, in some instances, literally eaten away. In the skin and mucous membranes it may persist for years, without greatly impairing the health of the individual. In the articular cartilages, although it may be equally protracted, it generally induces anchylosis, or death from constitutional irritation.

Ulceration always manifests a tendency to extend towards the nearest surface. This is a law which is attended with the most salutary effects; for, if there were no such provision, the individual, the subject of this process, would often fall a victim to its ravages. This tendency is well exemplified in the tibia. Ulceration, commencing in the interior of this bone, generally works its way through the part which is covered merely by the skin and periosteum, nature thus greatly economizing her time, and saving the surrounding structures from much mischief. Another beautiful illustration of this law is afforded by the liver. When an abscess is seated in this organ inflammation is gradually set up in its peritoneal covering, followed by an effusion of lymph, by which the viscus is glued to the stomach, the colon, or duodenum. Ulcerative action now begins, and steadily proceeds until a communication is established between the adherent parts, affording a ready outlet for the purulent fluid. In this manner nature effects, in a few days, what, if the opening were made through the skin and muscles, it would require weeks to accomplish.

The great *cause* of ulceration is inflammation conjoined with pressure. In many instances, however, it follows suppuration and gangrene. Nor is pressure always essential to the process. In many situations, indeed, as in the cutaneous and mucous textures, ulceration occurs without the slightest aid from this source. On the other hand, there are examples in which pressure appears to be the principal agent, as in caries of the bones produced by the presence of a large aneurismal tumor. The same disease disproves the idea, formerly so current, that ulceration can never happen without the formation of pus. Were any further illustration necessary of the fallacy of this opinion, we might refer to the cornea and mucous textures, where this process often occurs unaccompanied by the slightest effusion of matter.

The question here comes up, what is the nature of this concomitant inflammation? Is it of that description to which Mr. Hunter has applied the term adhesive? or does it possess a character altogether peculiar to itself? The latter supposition is certainly the most plausible as well as most in accordance with our knowledge of the subject. Every practitioner is acquainted with the fact that an inflammation, apparently of the same kind and degree, produced by the same cause, and affecting the same tissue, will, at one time, end in ulceration, at another pass off without any such occurrence. This can only be explained on the assumption that the inflammation which precedes and accompanies the ulcerative process is of a specific character, or, in other words, that it is modified by circumstances, either local or constitutional, or both conjoined, which the pathologist cannot appreciate. This opinion is the more plausible, as there are some erosions which invariably result from particular causes, and none other. The venereal ulcer has its peculiar features, not less than the tubercular, the herpetic, or the scirrhous. All these are specific affections, induced by specific agents, accompanied by specific inflammation, and followed by specific results.

An impoverished state of the blood powerfully predisposes to ulceration, and is probably, of itself, sufficient, in many cases, to produce this result. In extreme anæmia, where there is always great deficiency of fibrin and albumen, sores are very liable to form in various parts, especially in those which are remote from the central organ of the circulation, from the slightest congestion of the capillary vessels, without any positive evidence of inflammatory disturbance. A blister applied to the calf of the leg, or even the trunk, will, under such circumstances, often speedily degenerate into a foul, sloughy, or irritable ulcer. In typhoid fever, similar sores frequently occur on the hips and buttocks; and in scurvy nothing is more common than ulceration of the mucous and cutaneous tissues. In both these diseases, the blood undergoes important alterations, which lead to disorder of the nutritive function and lesion of the innervation, followed by local congestions in remote and dependent parts of the body, where the circulation is naturally weak and languid. In all cases of protracted anæmia the muscles become thin and flabby, the solids are poorly nourished, hemorrhagic and serous effusions occur, wounds heal slowly and imperfectly, and old cicatrices often break out into open sores. This was strikingly exemplified in Lord Anson's voyage to the Pacific Ocean, in which many of his crew suffered severely with the scurvy. It was remarked that those who had had sores before they embarked were attacked with ulceration in the same parts, and that, if their bones had been formerly fractured, they became disunited by the absorption of the callus. Ulceration of the cornea and other textures has been found to ensue in animals fed on sugar, starch, and other non-azotized articles of food, the protracted use of which greatly impoverishes the blood, and thus brings the system into a condition similar to that which exists in scurvy, chlorosis, and typhoid fever.

The ulcerative process is usually accompanied with more or less pain. In many cases, especially in the bones and cartilages, it is of a dull aching or gnawing character, as if insects were feeding on the part. Occasionally, it is entirely absent, or the patient experiences merely a slight degree of uneasiness. In some instances, it is continued; in others, intermittent; in others, periodical. Along with this symptom, there is often irritative, or hectic fever, with rapid emaciation, and great failure of the powers of the system. The inflammation which precedes the ulceration always continues until the process is completely arrested, and the ulcerated structures are either absorbed, or, as is far more usual, ejected.

Ulcers often heal. This takes place much more readily in some tissues than in others; but the process by which it is accomplished is the same in all, namely, by granulation. The different steps of this process, together with various other circumstances connected with ulceration, will be described in detail under the head of the different organs and tissues.

Ulceration may be regarded as, in some degree, a salutary process, or as a means employed by nature to rid the animal economy of extraneous materials. It has been already seen that collections of purulent fluids have a disposition to escape by the nearest and easiest route; and this is uniformly effected by the agency of ulceration. A ball lodged under the skin is removed in the same way; or it travels from one region to another, and is finally cut out at a considerable distance from the place where it was originally situated. It is useful also in the expulsion of tubercular matter, in the exfoliation of bones, and in the sloughing of soft parts. In other cases, again, as in old drunkards, the process seems to be designed to relieve the system of hurtful fluids, by establishing extensive sores on the legs, attended with a perpetual flow of irritating matter. Thus we see that ulceration, although apparently a very unpleasant, is in many instances a most fortunate event, and one for which the practitioner often anxiously looks.

---

# CHAPTER IX.

## GRANULATION.

**Importance of the Subject.—Nature of Granulations.—Difference in regard to their Vascularity and Sensibility.—How modified by Texture.—Are Secreting and Absorbing organs.**

LEAVING the subject of ulceration, I now come, by an easy transition, to speak of that of granulation. This process, like that of union by the first intention, is one of the grand operations employed by nature for the cure of wounds, and the filling up of ulcers. To the surgeon, a knowledge of this process is of indispensable importance;

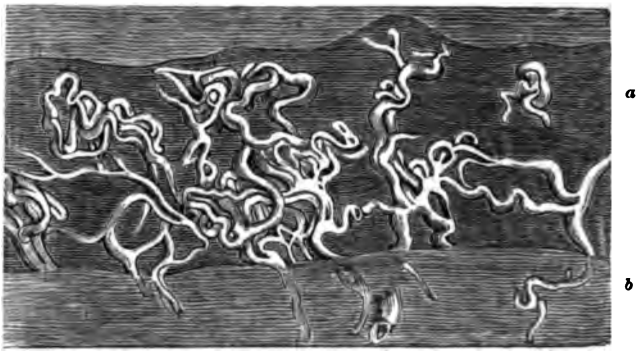
whilst to the inquisitive physiologist it discloses a series of changes, which, in point of interest, are not surpassed by any in the animal frame, whether in a sound or diseased state.

A granulation is a small, vascular body, generally somewhat mammillated in shape, more or less red, sensitive, and capable of secreting pus. It consists, in the first instance, essentially of coagulating lymph; and the process by which it is formed is very similar to that which is concerned in union by the first intention. Let me be understood. An individual receives a wound involving the skin and cellular tissue. The edges, instead of being brought into contact, are allowed to remain apart. Immediate adhesion being thus prevented, another process, more complex and tardy, is instituted. The sore now becomes painful, and, in short, exhibits all the ordinary phenomena of inflammation. A thin, watery fluid oozes from its surface; and, after some hours—generally from six to twenty-four—it is found to be slightly incrusted with lymph, by which its interstices are filled up, and the whole is made to assume a smooth, uniform appearance. The layer thus formed is of a whitish color, somewhat ropy in its consistence, homogeneous, and easily wiped away. If it be allowed to remain, in the course of a short time, varying from one to two days, sooner or later, according to the activity of the sore, the exudation becomes organized, partly by the subjacent old vessels extending into it, or, if we adopt the opinion of some, by the formation of new ones, which inosculate with those of the divided parts, and partly by structural changes which take place in the elements of the exudation. The surface of the sore is now of a red color, readily bleeds if it be touched, and is elevated into a great number of little rounded bodies, closely aggregated together, which are the rudimentary granulations. Another layer of plastic lymph is next effused, the vessels are still further elongated, and thus incrustation after incrustation is formed and organized, until the cavity is finally filled up. In these layers of plastic lymph organization by cell development may be observed independently of bloodvessels, and fibro-areolar tissue is generally abundantly formed from the cells of the granulation. The changes which the granulation cells undergo is best studied in the deeper seated layers, in which the cells are seen elongated and changing into fibres.

Not only does each granulation receive one or more arterial and venous branches, but, in all probability, also a small nerve and an absorbent. Such, at least, must be our conclusion when we reflect that this little body not only bleeds when roughly handled, but that it often becomes highly sensitive, and that it readily absorbs such substances as are placed in contact with it. Anatomists have not, however, as yet succeeded in detecting either nerves or absorbents in granulations. Some of the power of absorbing substances may be owing to the bloodvessels of the part, as physiology teaches us that such absorption frequently takes place from vascular surfaces.

The vascularity of these little bodies is much greater, I am disposed to think, than is usually imagined. That they are liberally supplied with vessels is at once indicated by their florid complexion, by the astonishing rapidity of their growth, by the facility with which they bleed when touched, and by the fact that they become hard and tumid if filled with injecting matter. The arteries, the precise number of which is not known, having entered the base of each elevation, soon separate into arborescent branches, which freely anastomose with each other, as well as with those in the granulations immediately around. Accompanying these arteries are corresponding veins, which carry away the blood which is not required for the nourishment of the part, the effusion of lymph, and the secretion of pus, with which the abraded surface is usually covered. Both classes of vessels are generally varicose, and much convoluted, as in Fig. 20, from Mr. Liston: *a*, representing the free surface of the injected granulations; *b*, the attached surface.

Fig. 20.



Structure of a granulation.

Granulations are often very sensitive. This, however, is not the case everywhere, or under all circumstances. In the cutaneous and cellular tissues, the granulations are, all other things being equal, incomparably more sensitive than in the tendons, aponeuroses, and ligaments. The same thing is true with respect to the granulations of the bones, except when they spring from the cancellated structure, in which case they are frequently so tender that it is impossible to touch them without inducing severe pain. These little bodies are also more sensitive when there is much inflammation, and in persons of an irritable and worn-out constitution than in such as are healthy and robust. In some instances, especially in old ulcers of the leg, they are more than triple the ordinary size, extremely pale, cold, apparently infiltrated with serosity, and so completely insensible that they may be cut without the least pain.

Granulations are absorbing as well as secreting bodies. These properties, however, are not equally well marked in all the tissues. A great difference, for instance, exists in this respect between the granulations which arise from the skin and those which arise from the bones, the former absorbing and secreting with great rapidity, while the latter perform these offices very slowly and imperfectly. A knowledge of this fact is of no little value in the practice of surgery, as it enables us, on the one hand, to avoid stimulating dressings, and, on the other, the application of such substances as have a tendency, when absorbed into the system, to give rise to dangerous results. Not a few cases are on record where arsenic, corrosive sublimate, and other articles of the materia medica, placed in contact with a granulating sore, have destroyed life. The extract of belladonna, used in this way, will produce temporary amaurosis, mercury will salivate, and opium, it is well known, will occasion sleep nearly as soon as when introduced into the stomach.

Thus, granulations are a very interesting and important set of textures, extremely complex in their structure, and performing the triple office of pouring out lymph, secreting pus, and absorbing such substances, to a greater or less extent, as are brought in contact with them. The facility with which they are developed is much greater in some tissues than in others, depending on the degree of laxity and vascularity of the part from which they spring. The concomitant inflammation appears also to be of a mixed character, as it is attended with the simultaneous effusion of lymph and purulent matter; and it is important that the phlogistic action should not transcend certain bounds, otherwise the process will be interrupted, retarded, or wholly suspended. The skin and cellular substance appear, of all the tissues, to be most susceptible of granulation. Mucous membranes, aponeuroses, ligaments, tendons, cartilages, and bones, together with the internal viscera, excepting, perhaps, the brain, rarely heal in this manner, and then only after a long time.

# CHAPTER X.

## CICATRIZATION.

**Nature of the Process.—Different Steps.—Do Ulcers never heal from the Centre?—Process of Cicatrization influenced by the Form and Situation of the Sore.—Meaning of the term Cicatrice.—Reproduction of the original Tissues.—Transformations of Cicatrices.**

THE subject next in order is cicatrization. The remarks which I shall offer respecting it must necessarily be brief, as a great deal of what might be said will more appropriately fall under the head of the different organs and tissues.

Cicatrization is the process which nature employs to heal wounds and ulcers. It is the finishing stroke, if the expression be allowable, of granulation, the labor necessary to polish the surface of the sore, to contract its diameter, and to bring it as nearly as possible to a level with the surrounding structures. This process, although it is not limited to the skin, as might be inferred from reading some modern treatises on surgery, is yet most advantageously studied there, as it enables us, as it were, to follow nature in the different steps of her enterprise.

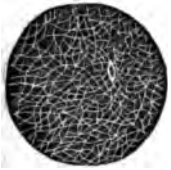
The first step in the healing of an ulcer is the subsidence of the inflammation, which becomes gradually less and less, until the surrounding parts regain their natural color, form, and consistence. The sore at the same time sensibly diminishes in diameter, by the contraction and coalescence of its granulations; and its surface, instead of being rough and uneven, assumes a smooth, glassy appearance, its centre, however, being still considerably depressed; or, if the granulations have been very exuberant, unnaturally elevated. Cicatrization is now observed to begin; the first indication of it being a thin, delicate, bluish pellicle, placed along the margin of the breach, where it soon unites with the old skin by an interchange of tissue, of vessels, and nerves. If the part be inspected at a later period, the substance that was thus deposited and organized, will be found to have increased in thickness and density, and to be gradually extending itself towards the centre of the ulcer by the addition of new matter. It is in this manner, by this successive experipheral action, that the denuded surface is eventually covered over.

But do ulcers and wounds never heal from the centre? This is a topic concerning which pathologists have expressed different sentiments, some maintaining the affirmative, others the negative side of the question. From an inspection of numerous cases, I am convinced that the process of cicatrization takes place only in the way in which I have here described it. To this remark there is only a single exception. In extensive wounds, especially of the lacerated kind, it often happens that portions of the original skin remain, forming so many little patches in the midst of the abraded surface. In such cases, the cicatrization goes on simultaneously around these parts and along the principal edges of the solution of continuity. There is, however, no new law in operation here, since the old skin is the starting-point of the new in both instances.

The process of cicatrization is much influenced by the form and situation of the sore. Circular-shaped breaches of continuity heal much slower, *cœteris paribus*, than such as are longitudinal, for the obvious reason that it takes the new skin a much longer time to reach the centre in the former than in the latter. A sore in the leg cicatrizes with more difficulty than one on the trunk; and a callous ulcer than a soft one.

When the cure is completed, a *cicatrice* is left, or, as it is called in familiar language, a scar. This is always much smaller than the original sore, and still further diminishes by the contraction of the new skin. When the breach of continuity has been of great extent, as when it has been produced by a burn, this contraction is often a source of great mischief and deformity. At first, the cicatrice is extremely vascular, soft, and of a bluish color; afterwards the vessels decrease in size and number, and the part becomes dense, bloodless, and whiter than the original skin. This is well seen in persons who have had confluent smallpox, and in those who have

Fig. 21.



Structure of a cicatrice of the skin.

been covered with venereal blotches. The vessels of the cicatrice are curiously interlaced, and anastomose freely with each other, so as to form a very fine and delicate network, as in Fig. 21.

Are the original textures, in the formation of cicatrices, always regenerated? and, if so, in what respect, if any, do they differ from them? Cartilages and muscles are said to be the only parts not susceptible of reproduction. But even this is extremely doubtful; at any rate I am certain that I have seen muscles, which were almost entirely torn asunder, unite through the medium of fleshy matter. Some time since, I had under my charge a healthy lad, eleven years old, who had a large piece of the great pectoral and broad dorsal muscles torn away by a steam-engine, in which the breach of continuity was repaired by a substance perfectly identical with the original. The granulations were unusually florid, highly sensitive, and grew with astonishing rapidity. In old subjects, it is probable that the junction is effected by tendon. The cartilages of the ribs generally unite by osseous matter, as certain pieces of the skeleton, such as the patella, the olecranon process, and the neck of the femur do by cartilaginous.

In most instances, however, the reproduction is imperfect. This is the case even with the skin. The cutis is never so strong or so capable of resisting the effects of disease as in the normal state; it is not provided with sebaceous follicles, the mucous network is but imperfectly regenerated, and the epidermis drops constantly off in thin, dry, furfuraceous scales. No hairs are to be seen on the scar; for, as their roots have been destroyed, they cannot, of course, be reproduced. The same imperfect development is observed in the cicatrization of the mucous and some other tissues.

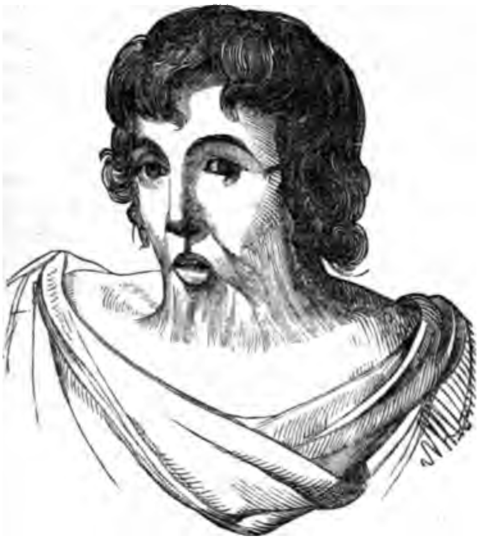
Cicatrices, like other analogous tissues, may undergo various changes. Of these the most frequent and important are, inflammation, inordinate contraction, hypertrophy, and malignant degeneration.

All newly-formed parts are liable to inflammation, the effects of which they are much less capable of resisting than the primitive tissues, owing to the fact of their possessing a much lower grade of vitality. Hence, even when the morbid action is not very high, it may readily lead to softening, gangrene, or ulceration. In protracted anæmia, and in nearly all other diseases attended with an impoverished condition of the blood, cicatrices of the skin are extremely prone to suffer; their vessels become congested, their surface is discolored, and their tissues are invaded by ulceration or gangrene.

Inordinate contraction (Fig. 22) is most common in cicatrices produced by burns. These injuries are often followed by the most unsightly deformity, owing to the atrophy of the newly-formed tissues, and the property which they possess of diminishing their diameter. In this manner the chin may be drawn down upon the sternum, the hand bent upon the wrist, the arm pinioned to the side, and the leg flexed upon the thigh. Even the bones may be curved, and forced from their natural position, so great is this contractile power.

A cicatrice may become hypertrophied, or grow into hard knobs or ridges. The best form of this occurs in burns, in consequence of some defect in the modelling process. The ridges have a rough, uneven surface, and a dense, fibrous structure; they creak under the knife, and the section exhibits a white, gristly appearance. The cuticle is thick and dry, and scarcely any cellular tissue exists in it in a free state.

Fig. 22.



Burn of the neck. Deformity caused by contraction of the cicatrice.

Old scars, whether produced by a burn, cut, or laceration, or whether the skin alone is injured, or other structures along with it, become occasionally the seat of malignant growths. The disease usually appears in the form of a little excrescence, which is dry and covered with cuticle, but which soon becomes moist, and partially ulcerated, secreting a thin, fetid, semi-purulent fluid. The excrescence is gradually converted into a more solid tumor, which may acquire the volume of a pullet's egg, and display all the characteristics of scirrhus, encephaloid, or epithelial cancer. Ultimately ulceration sets in, fungous granulations spring up, and the patient dies from the irritation and discharge. The disease rarely returns if thoroughly extirpated.

# CHAPTER XI.

## INDURATION.

**Definition.—Color, Size, Weight, and Degree.—Period necessary for its production.—Causes.**

By this term is designated that peculiar pathological condition of an organ which is characterized by an increase of its consistence, whether arising from the deposition of a new product, from a deficiency of the natural secretion, or simply from the transformation of its elementary tissues. This definition does not, of course, include the induration produced by the heterologous formations, such as tubercle, encephaloid, and scirrhus, with the latter of which the present disease is unfortunately too often confounded.

Induration is an extremely common lesion, and may occur in any ssue of the body, but is most frequently seen in the spleen, liver, mphatic ganglions, and subcutaneous cellular substance; next to hich, the lungs, heart, brain, ovaries, breasts, and prostate gland are e most common seats of it. No age, sex, or condition of life is xempt from it; and it has been witnessed even as an intra-uterine ffection, or within a few days after birth. Like many other diseases duration may exist alone, or in association with other alterations; may affect a part of an organ, its whole substance, or only one of s anatomical elements.

The *color* of the affected part usually partakes, to a greater or less xtent, of the natural complexion of the organ. The most ordinary nts are red and gray, with numerous intermediate shades of white, ellow, brown, and black. As a general rule it may be stated, that e intensity of the color is in proportion to the vascularity of the fected part, and the violence of the exciting cause. Thus, in acute neumonitis, the induration—hepatization—is almost always characrized by deep redness, often verging on purple, whilst, in the chronic rm of the disease, it is commonly of a dirty pale color, grayish, or ppled. When the induration occurs in structures that are naturally ght, as in the subserous, submucous, and subcutaneous cellular tissue, ere is always more or less concomitant opacity.

The *size* of a part in a state of induration may be natural, augmented, diminished. An increase of bulk is by far the most frequent, d is sometimes very considerable in induration of the liver, spleen, d lymphatic ganglions. A diminution of size is by no means usual, but cannot be regarded as a necessary consequence of the sease; the same remarks are applicable to the weight of the affected gan, which is much more frequently above than below the normal andard. There are other physical changes attendant on this pathogical condition, which need only be alluded to in this place, such as minished humidity, altered sonorousness, and loss of elasticity. hese changes are strikingly exemplified in inflammation of the pulonary tissue, which becomes dry, hard, increpitous, sinks in water, d emits a dull sound on percussion of the chest.

The *degree* of induration is liable to considerable variety, depending on a number of contingent circumstances. Parts that are naturally ft and flaccid are often, when thus affected, rendered quite dense, m and unyielding. Of this the lung affords a remarkable illustran. In the sound state this viscus is soft, spongy, and elastic, but, hen in a state of induration, it is sometimes almost incompressible, d cuts like old cheese, occasioning a peculiar grating sound under e knife.

Considered in a general point of view, induration may be said to esent three degrees, which it is of some importance to distinguish. the first, the part still retains its moisture, and feels only a little naturally dense; in the second, it is already firm, dryish, and conlerably altered in color; in the third, its consistence is so much reased as to resemble the white of a hard-boiled egg, old cheese, or fibro-cartilage, every trace of its original softness, juiciness, and pliancy being gone.

As to the time requisite for the production of these several degrees of induration, no definite rule can be established, as it is influenced by a variety of circumstances, the consideration of which must be deferred until we come to speak of the special pathology of this affection. In the great majority of instances, however, the process is remarkably slow; weeks, months, and even years elapsing before it reaches its full development. In other cases, on the contrary, it forms with great rapidity, a few days being sufficient for the alteration of a tissue from its normal consistence to that of a firm, dense mass. Thus, if we consider the disease in reference to the period necessary for its development, it may be said at one time to be chronic, at another acute, the former being much the more frequent.

The *causes* of this pathological state are referable, for the most part, to inflammation, followed by an effusion of coagulating lymph into the interstitial substance of the affected organ. In the lungs there is frequently, in addition to this, more or less blood poured out, which, combining with the natural structures, gives them a red color. It is thus that red hepatization is established. In chronic cases, on the other hand, the induration is commonly effected by the lymph alone; and hence it is that the organ is usually of a much lighter hue. In the hardening of the subcutaneous cellular tissue of infants, a disease of pretty frequent occurrence in certain districts of Europe, the effused matter is generally impregnated with two coloring principles, the one of an orange red, the other of a bluish shade.

From the foregoing considerations, it is certain that one variety, at least, of induration is dependent upon inflammatory irritation. In a second series of cases, the lesion, if such it may be called, appears to arise from a deficiency merely of the natural secretion. To this category belongs the induration of the various organs and tissues observable in old people. As we advance in life, the whole body experiences an astonishing change in its consistence; many of the vessels are obliterated, the juices are dried up, the solids are rendered hard and rigid, and, as a natural consequence, the movements are difficult and imperfect. An increase of consistence from this cause is generally most considerable in the cellular tissue, the mammæ, ovaries, prostate gland, the muscles of voluntary life, and the bones, the latter of which sometimes acquire a degree of hardness equal to that of ivory. The proximate cause of this condition is probably a diminution of the vascularity of the affected part, attended with a deficiency of the normal secretion, and perhaps, also, a partial absorption of its more tender anatomical constituents. The part thus becomes hard, dry, and, where the circumstances are favorable, shrivelled and corrugated.

In a third series of cases the induration is traceable to a real transformation; that is, some of the effused material becomes organized into dense tissue, whilst, on the other hand, some of the anatomical elements of the affected part may disappear, leaving nothing but the original framework. Examples of this description are occasionally seen in the liver, spleen, and lungs, around hydatids, seroüs cysts, tubercles, and other tumors. The irritation caused by the presence of these adventitious growths produces a partial absorption of the natural structures, leaving those which remain in a dense and indurated state. Similar effects are sometimes brought about by protracted compression, whether occasioned by bands of false membrane, or by large accumulations of fluid. Of this a striking illustration is furnished by the lung. In chronic pleuritis, attended with copious effusion, this organ is often reduced to the size of a small cake, by the approximation simply of its solid textures, which are thus rendered unnaturally dense and hard. If the compression is not kept up too long, these textures may be made, in time, to resume their natural bulk, form, and consistence; and so the respiratory function be gradually restored. This variety of induration is almost constantly associated with atrophy.

Such are the several forms of induration which are noticed in the different organs and tissues of the body, and the causes under the influence of which they are produced. Let us next proceed to inquire, whether parts thus affected can regain their natural consistence, and, if so, under what circumstances?

The former of these queries can be easily answered; the latter properly belongs to therapeutics, and need not, therefore, be particularly discussed on the present occasion. That induration is susceptible of being cured, daily observation abundantly testifies. This remark is especially true in relation to the chronic form of the lesion; in the acute it is not so common, the disease usually reaching a fatal height before the system can properly react; yet even here recovery is far from being infrequent. As the induration of which I am now speaking is caused by the deposition of a new product, it is obvious that whatever has a tendency to remove this, must be instrumental in bringing about the restoration of the affected part. It is with a view of accomplishing this object that the practitioner resorts to the exhibition of iodine and other kindred articles, when the disease is located in some internal organ; or that he uses friction and other stimulating means, if it be seated externally. In either case he is desirous of producing the same effect, namely, the absorption of the effused substance, the incorporation of which with the natural textures gives rise to the lesion under notice. The time required for effecting this object cannot be specified, as it must be influenced by a great variety of circumstances which it would be out of place here to consider. In acute cases, the induration frequently subsides in the course of a few weeks, even when it involves a very large extent of surface and a multiplicity of tissues; in chronic, on the contrary, the process is usually very tardy, months elapsing before it is completed. In the meantime, the function of the part is imperfectly executed, and the longer the case is protracted the greater will be the danger that the organ will never recover its original consistence. Under such circumstances the affected textures frequently undergo the fibro-cartilaginous, cartilaginous, and osseous transformations; and, it is even thought by some, that they are apt to degenerate into malignant disease. This, however, is doubtful; at all events, I have never seen a case in confirmation of it.

# CHAPTER XII.

## HYPERTROPHY.

**Meaning of the term.—Liability of different Structures.—Causes.—May be general or local.—Color, Weight, and Volume of the Part affected.**

THE word hypertrophy was originally restricted to those preternatural enlargements which are so frequently found in the heart and thyroid gland. As understood at the present day, however, it has a much more extensive application, being employed to designate an important class of lesions, the essential character of which consists in an abnormal development of the weight and volume of the various organs of the body without, in many instances, any accompanying alteration of their organization and structure.

With the exception of the serous membranes, the ligaments, and tendons, there is not a single organ which is not occasionally found in a state of hypertrophy. Nevertheless, there are some structures in which it occurs more frequently than in others, and amongst these may be particularly specified the heart, adipose tissue, spleen, thyroid gland, lymphatic ganglions, breast, bones, and bloodvessels. Hypertrophy is seldom seen in the brain, spinal cord, and nerves. It rarely commences in people below middle age, and from forty to fifty may be mentioned as its favorite time of invasion; but it is often observed in persons much younger than this, as in those who are not more than five, ten, or fifteen. Indeed, it would seem occasionally, as is the case of the thymus gland, to come on soon after birth, if not before.

As to the *causes* which are concerned in the production of hypertrophy, some are of a general, others of a local character. Of the former, very little can be said to be known with any degree of certainty, as the affection in question sometimes occurs in spite of the most abstemious course of living. In polysarcy, the body has been known to attain the enormous weight of upwards of seven hundred pounds, without the individual being at all remarkable as a large eater. In such cases,—which depend chiefly upon an inordinate development of fatty matter,—there would seem to be a peculiar diathesis, almost everything that the person consumes being converted into adipose substance.

Of general hypertrophy a most extraordinary example is recorded in the first volume of a French periodical, entitled *The Hebdomadary Journal of Medicine.* The individual was a girl, twenty-nine years of age; during the last eleven of which she had suppression of the menses, embarrassed respiration, numbness of the limbs, and frequent attacks

eadache, with progressive development of the cutaneous, adipose,
ılar, and muscular tissues. At the period here specified, the face
enormously enlarged, the tongue almost filled the mouth, the
was extremely thick, and the breast reached nearly to the chin.
circumference of the trunk was five feet two inches, just equal to
height of the body, and the extremities, both upper and lower,
of prodigious size. This extraordinary bulk was not caused by
excessive accumulation of the subcutaneous fat alone, as all the
rnal muscles appeared prominent and well-defined. The heart was
ertrophied in the same proportion, and struck with unusual vio-
e against the side of the chest. The brain likewise participated in
abnormal growth, and the girl finally became idiotic. In this case
symptoms above referred to are obviously insufficient to account
he origin of the excess of nutrition, and we must therefore sup-
that the individual labored under some constitutional peculiarity.

ocal hypertrophy may occupy an entire organ, or, as more fre-
ıtly happens, be confined to particular sections of it; it may exist
e, or in connection with other lesions.

he local causes which manifest their effects in the production of
ertrophy are, first, chronic inflammation; secondly, mechanical
ruction; thirdly, inordinate exercise. Each of these topics we shall
avor briefly to illustrate.

hat chronic irritation may produce hypertrophy is a fact of which
y pathologist must have witnessed frequent examples. Who has
seen the lymphatic ganglions of the groin preternaturally enlarged
n irritation of the head of the penis, of the mesentery from ulcera-
of the ileum, and of the bronchiæ from disease of the lungs? En-
ement of the liver and spleen, sometimes to a very great extent,
es undoubtedly from this cause. In chronic dysentery, not only
mucous and submucous cellular textures become hypertrophied,
the affection often extends to the muscular tunic, which occasion-
attains an extraordinary degree of development. The follicles and
sities, which are hardly perceptible to the naked eye in the healthy
e, are also rendered extremely prominent, the former being some-
es of the size of a mustard-seed, the latter more than a line in length.
imilar development is frequently observed in the coats of the urin-
bladder, in consequence of chronic inflammation.

ypertrophy may be caused, secondly, by some mechanical impedi-
nt interfering with the due performance of the functions of an or-
. This is frequently seen in the heart, where, in consequence of
ase of the valves, preventing the easy passage of the blood, the
us is obliged to undergo increased action, and so becomes more or
enlarged. In the muscular fibres of the stomach, the same change
ften witnessed from obstruction at the pylorus, and in those of the
nary bladder, from stricture of the urethra, or hypertrophy of the
state gland.

ypertrophy may, in the third place, occur solely from the increased
on of an organ in the discharge of its normal functions. Of this
ety examples are found in the muscular system of animal life, in
lungs, and in the kidneys. In every part of the frame, the muscles

are proportionate, in size and structure, to the efforts required from them; and it is a law of nature that, whenever they are frequently called into action, their fibres become considerably augmented in thickness, and capable, consequently, of much greater exertion. Thus the blacksmith, who constantly uses his arms in striking with his hammer, has much larger and stronger muscles than the dancing-master, who merely employs his legs. The same is true with regard to the lungs and kidneys. When one of these organs is imperfectly developed, compressed by effused fluid or some morbid growth, or, as in the case of the latter, entirely absent, the other is sure to become preternaturally expanded, thereby compensating for the deficiency. There are some viscera which are subject to temporary hypertrophy. Of this description are the uterus and mammary gland. During pregnancy and lactation these organs increase very much in bulk, but again diminish soon after parturition and weaning.

The *color* of a hypertrophied organ is subject to considerable diversity. Most generally, perhaps, it is somewhat heightened, especially when the affection is wholly physiological. Occasionally it is very much diminished; and cases are often observed where it is apparently quite natural. The consistence may likewise be normal, diminished, or increased. These three conditions do not, however, occur with equal frequency. An increase of density is by far the most common, and is particularly conspicuous in hypertrophy of the heart, mammary gland, the muscular fibres of the stomach and colon, the lymphatic ganglions, cellular tissue, bones, liver, spleen, and kidneys. A diminution of consistence is extremely rare, and cannot be viewed as a necessary consequence of the lesion.

An increase of *weight* of the affected organ follows, as a necessary consequence, in all cases where the lesion is not conjoined with atrophy. An augmentation of volume is by no means constant. Thus, in hypertrophy of the heart and bladder, there may be great development of the muscular fibres, with marked diminution of the size of their cavities. A change of form always arises when the hypertrophy is partially circumscribed, or limited to a particular point, as in the bones, skin, heart, bronchial tubes, and bloodvessels.

Hypertrophy essentially consists in an augmentation of the nutritive function. When in a state of unusual activity, the quantity of blood which an organ receives is considerably increased, in consequence of which it assumes a deeper color than one that is less exercised, at the same time that it augments somewhat in density. The elementary particles are increased in number, or such as already exist are augmented in size; it is in this manner that the change under consideration is brought about. In that variety of it which results from chronic irritation, it is not unlikely that there is often superadded to the alteration just mentioned a deposit of new substance in the spaces of the connecting cellular tissue, leading thus to a real change of structure. The effects of hypertrophy on surrounding parts will be pointed out when we come to speak of this lesion as it occurs in different tissues of the body.

# CHAPTER XIII.

## ATROPHY.

**May be General or Partial.—Causes: want of Exercise; Diminution of the Nervous Influence; Deficient supply of Blood; Inflammation.**

LY the reverse of the lesion now described is atrophy, an of frequent occurrence, and of great practical interest. Like phy, with which it often coexists, it may pervade the entire , or be limited to a single viscus, or even to one of its ele- constituents; and as the one essentially consists in an increase itritive function, with a corresponding augmentation of bulk, her must be regarded as depending on imperfect exercise of function, with a corresponding diminution of the affected part. l atrophy, commonly called marasmus, emaciation, or con- , frequently arises from organic disease of the lungs, heart, and and from morbid enlargement of the mesenteric ganglions, g the passage of the chyle from the intestinal tube into the duct. Occasionally, however, this lesion of the nutritive exists in a very high degree without any ostensible cause. es not recollect the extraordinary individual who was ex- n this country, some years ago, under the sobriquet of the skeleton?" Calvin Edson, for such was his name, weighed y-eight pounds. He was forty-two years old, five feet two igh, and formerly weighed one hundred and thirty-five pounds. he last sixteen years of his life he had been gradually wasting, any apparent disease, his appetite and health being as good . In another instance of extreme atrophy of the general in a young Frenchman named Seurat, who was shown in not long ago, the lesion seems to have been connected with t alimentation, as the individual did not, on an average in ity-four hours, take more than three or four ounces of food, ttle wine.

imals have a period of growth, maturation, and decay. In an subject, the body, after having reached the age of forty, o exhibit traces of decline, which from this time on become y more and more conspicuous, until the machine is literally it, and man "goeth to his long home." Examined at this he whole mass of the brain is generally found diminished in nerves have lost their moisture, and the ganglia connected m are condensed, and considerably shrunk in volume. The ry system experiences similar changes: the lungs are dryish, inelastic, and increpitous, their volume is sensibly lessened, the walls of the air-cells are attenuated, and whole lobules are sometimes deprived of their vesicular structure. The muscles of voluntary life are pale, flabby, and diminished in bulk; the arteries, veins, and absorbents shrink in their diameter, and a large proportion of the more minute ones, becoming useless, are obliterated, and lost; the lymphatic ganglions are hard, small, and many of them entirely disappear; the bones are spongy, brittle, and extremely prone to fracture; the ligaments are unusually slender; the articular cartilages are dry, and attenuated; and the salivary glands, together with the liver, pancreas, spleen, and kidneys, are indurated, and considerably reduced in size. In the male sex, after the functions of the testicles have ceased, absorption frequently commences in these bodies, which shrink, become soft, pulpy, and are sometimes not larger than a French bean. The cells of the penis are augmented, and their fibrous parietes very much attenuated, in some instances even partially absorbed. In the female, the ovaries are pale, shrivelled, and frequently transformed into a condensed grayish substance; the mammæ are soft and flabby, with scarcely a trace of their original structure; and the uterus is hard, firm, and diminished in volume.

Along with the changes of texture here described, are to be observed certain alterations in the various fluids. The digestive function being less vigorously executed than in youth and manhood, there is a less perfect elaboration of the chyle, followed by a deteriorated state of the blood which is prepared from it. Nor does the difficulty end here. On reaching the lungs, the vital fluid, in consequence of the deranged state of the pulmonary tissues, is but partially acted on by the atmosphere, and is thus rendered unfit for the proper nourishment and stimulation of the various organs and textures of the body. The jelly, which exists in such great abundance in young persons, totally disappears in decrepitude, its place being usurped by albumen and fibrin. The various secretions are likewise modified, and everything indicates that the blood has undergone important changes, both in its physical, chemical, and vital properties. Such is a rapid sketch of *senile* atrophy, a state which strongly illustrates the effects of the wear and tear of the animal machine.

Local atrophy may affect an entire organ, a portion of an organ, or one or more of its anatomical elements, exist as the only lesion, or be associated with other diseases. The causes which give rise to this affection are, first, cessation of the function of an organ; secondly, diminution of the nervous influence; thirdly, deficient supply of blood; and fourthly, inflammatory irritation.

It appears to be a law of the animal economy, that when an organ is of no further use, it gradually falls into a state of decay. Of this class of structures are the umbilical vesicle and the pupillary membrane of the fœtus, the former of which, after having subserved the purpose of its formation, disappears at the close of the third month, the latter between the seventh and eighth. The kidneys are preceded in the embryo by two jelly-like parts, to which the term Wolffian bodies has been applied, as they were first pointed out by Dr. Wolff, a German anatomist. These bodies, which exist not only in the mammalia, but likewise in birds and amphibia, acquire their greatest bulk about the middle of utero-gestation, after which they gradually diminish by absorption, and at length entirely disappear. The gubernaculum, which is visible in the tenth week of embryotic life, is a thin membranous process, which guides the testicle to the internal ring, and is finally converted into cellular substance. These are instances of atrophy from the cessation of the functions of an organ in the fœtus. After birth changes not less remarkable are to be observed; such, for example, as the wasting of the thyroid body, the supra-renal capsules, and the thymus gland. From the same cause the alveolar processes of the jaws disappear after the removal of the teeth. In the female, the ovaries shrink after the decline of the menses; and, in conformity with the same law, the testicles often diminish remarkably in size in monks, who lead a life of celibacy, in the strict observance of their vows.

Atrophy may result, secondly, from a diminution of nervous influence, a circumstance not surprising when it is recollected how much the action of the capillaries is under the control of the cerebro-spinal axis. Whole limbs sometimes waste from this cause; in other cases, the lesion is more limited, and implies a very partial disorder of the nerves. It has been observed that, when atrophy is caused by disease of the brain, it occurs much more slowly than when it is occasioned by an affection of the nerves of the part. The reason of this difference is not very obvious.

The most remarkable examples of atrophy of the extremities are those which result from pressure on the axillary and sciatic plexuses. A few years ago I had under my care a young man who had received a dislocation of the humerus fifteen months before, which was permitted to remain unreduced. The head of the bone rested on the brachial nerves, and, although the limb retained a considerable degree of motion, the muscles were exceedingly soft and wasted in comparison with those of the other arm. Professor Lobstein,[1] of Strasburg, mentions a somewhat similar case, which he observed in a man fifty-four years of age. When a child, he was thrown down in the street, and, soon after, the right limb became very feeble, soft, and reduced in size. On dissection, all the muscles were found extremely pale, and as thin as membranes; the gastrocnemius and soleus weighed less than three ounces, whilst those of the sound limb weighed nearly eight, the tendo-achillis of the former being only two lines in thickness, of the latter, five. The right hip-bone was considerably reduced in size and thickness, and the corresponding femur weighed only three ounces, two drachms and a half, whilst that of the opposite side weighed nearly double. The nerves themselves, as well as the bloodvessels of the diseased extremity, did not seem to be perceptibly altered.

Another cause of local atrophy is a deficient supply of sanguineous fluid. When any part is deprived of its usual quantity of blood, it very soon becomes enfeebled, its substance is rendered pale and flabby, and it at last loses the power of action, although every other condition for its performance may remain unimpaired. Thus the testicle wastes after tying the spermatic artery; and, for the same reason, the muscles of the lower extremity frequently shrink after securing the principal vascular trunk of the thigh. Atrophy of the heart is sometimes produced by ossification of the coronary vessels, and a case is recorded in which the spleen, from the obstructed condition of its artery, was not larger than a filbert. In old age, as was before intimated, many of the capillaries are obliterated; and it is not improbable that to this circumstance is owing that diminution of the size of our organs, which constitutes senile atrophy. To the same cause is to be attributed the wasting of the lung and heart, from the accumulation of fluids in the pleuritic and pericardiac cavities.

---

[1] Traité d'Anatomie Pathologique, t. i. p. 90.

Finally, a fourth cause of atrophy is inflammation. The irritation excited by the presence of biliary concretions in the gall-bladder is sometimes followed by complete wasting of that organ. Hepatitis often gives rise to atrophy of the parenchymatous structure of the liver, and orchitis, especially when supervening on mumps, is not unfrequently succeeded by impotence. How the lesion is produced, in these cases, it is not easy to determine. It is probable that the chief fault is in the arterial capillaries, which cease to perform their accustomed functions, and thus allow the absorbents to carry off more than the usual amount of organic matter.

## CHAPTER XIV.

## FISTULES.

Definition.—Distinction into Complete and Partial.—Most common Situation.—Nomenclature.—Length and Diameter.—External and Internal Orifices.—Direction.—Lined by Adventitious Organized Membrane.—Nature of the Discharge.—State of the adjoining Tissues.—Causes.

A FISTULE is a narrow track, straight or tortuous, of variable depth, having generally two distinct orifices, lined by an adventitious membrane, and bathed with a thin, gleety fluid, intermixed with the natural contents of the part, organ, canal, or cavity affected. The disease, which is always of a consecutive nature, occurs in different regions of the body, and is developed under the influence of various causes.

Although the abnormal track has usually two openings, one of which is superficial, and the other deep-seated, yet this is by no means constantly the case. Hence the distinction of fistules into complete and partial. The terms recent and old, used by some writers, refer merely to the duration of the disease.

The lesion may occur in almost any situation, but originates most frequently in the anus, the perineum, the face, groin, and mammary gland. Fistule of the neck, thoracic cavity, the biliary apparatus, the stomach, colon, and small bowel, kidney, pancreas, and urinary bladder is comparatively rare. It takes place in both sexes, and at every period of life; but children and young persons suffer much less frequently than the old and middle-aged.

The nomenclature of fistule is quite extensive, and probably more intricate than that of any other lesion. The names are derived either from the parts in which the abnormal passage is situated, as anal, perineal, broncho-pleural, and recto-vaginal; or from the nature of the discharge, as salivary, urinary, and stercoraceous.

Fistules vary much in their *extent*. The longest tracks are those which occur along the spinal column, in connection with psoas abscess. In this affection the matter, which is of a scrofulous character, generally points in the groin, just above Poupart's ligament, in the upper part of the thigh, or, lastly, in the ileo-lumbar region, where it ultimately escapes by ulcerative absorption. The channel which is thus established varies in length from six to twelve inches, and is always lined by a well organized adventitious membrane, which continues to secrete, for a long time, the same kind of fluid as that which was discharged in the first instance. Tracks of considerable length are sometimes met with in the internal organs, as between the kidney and lung, between one coil of intestine and another, or between the urinary bladder and the cutaneous surface. In other situations, on the contrary, the passage is remarkably superficial, being hardly two or three lines from the surface, or from the cavity with which it communicates.

In their diameter these anormal tracks are not less variable than in their length. Sometimes they are so small as scarcely to admit the finest bristle; while at other times they are sufficiently capacious to receive a goose-quill, or even the end of the finger. The narrowest tracks usually occur in the lachrymal passages, the salivary glands, the anus, and the perineum. It is not often that the fistule is of the same uniform diameter throughout; on the contrary, it is almost always larger at one point than at another.

The external *orifice*, generally of a rounded or oval shape, may be so narrow, on the one hand, as to be hardly perceptible, or, on the other, so large as to admit the end of a probe, a goose-quill, or a finger. It may have sharp and well defined margins, or be surrounded by a soft, spongy, florid rim; or, lastly, it may be depressed or infundibuliform. The number of external orifices varies in different cases. In general, there is only one, or, at most, two or three; but occasionally, though rarely, there are as many as six or a dozen. When the number is very considerable the affected surface commonly presents a cribriform appearance.

The internal orifice may be of the same size as the external, or it may be smaller or larger. In its shape it is usually irregularly rounded, and it is seldom that it is found multiple, even when the number of external openings is considerable.

In its direction the passage may be perfectly straight; but in a great majority of cases it is more or less flexuous, serpentine, oblique, or winding. Occasionally it forms nearly a right angle with the surface on which it opens. When several tracks exist they often run together, and open by one common orifice upon the reservoir with which they communicate.

*Nature.*—A fistule, in its recent state, is nothing more than a raw surface, studded with granulations, and secreting purulent matter. It is, in fact, an ulcer, an open sore, a solution of continuity, which must undergo a process of reparation before it can be justly entitled to its distinctive appellation. The track, however, soon becomes smooth, and is speedily coated with an adventitious membrane, varying in thickness from a mere film to half a line, a line, or even the sixth of an inch. This new layer, at first soft and easily detached, gradually augments in density, and is at length inseparably united to the parts which it serves to line. Its color, like its consistence, is influenced very much by its age, and by the nature of the secretion or excretion which passes over it. At an early period it is red, pink, or rose; but in cases of long standing it is either white, gray, or slightly bluish. The free surface of the membrane is smooth and polished; or it is rough, mammillated, or studded with villi of various shapes and sizes. The other surface is attached by means of short cellular substance to the parts upon which it lies. Bands of lymph sometimes extend from one side of the abnormal channel to the other, as in the bridle stricture of the urethra; but this is rare.

The membrane above described is formed from the plastic lymph of the blood, and is of the same nature as the pyogenic membrane of a chronic abscess. Around the anus, in the perineum, and in some other regions, it bears no little resemblance to the mucous tissue, but differs from it in having no follicles and no distinct epithelial layer. It is liberally supplied with vessels, nerves, and, probably, with absorbents, is the seat of a constant secretion of gleety or other matter, and is liable, like all new textures, to inflammation and its consequences. In ancient cases it occasionally acquires a dense, fibrous, or even fibrocartilaginous consistence.

The nature of the discharge in this disease varies with the situation of the abnormal passage. In general, it is thin and gleety, as in chronic gonorrhœa, and mingled with the natural secretions, or excretions of the reservoir with which the fistule communicates. When the lining membrane, however, labors under inflammatory irritation, the discharge is either entirely suspended, or it is bloody, purulent, or mucopurulent.

The parts in which the abnormal track is situated are variously affected. In some cases they are nearly natural; but in general they are firm and callous, from the effusion and organization of plastic lymph, which, being often present in large quantity, completely obliterates the meshes of the connecting cellular tissue.

Finally, the *causes* which give rise to fistules are either mechanical or vital. To the first class belong wounds, contusions, and lacerations; to the second, ulceration, gangrene, and the formation of abscesses. There is a variety of fistule which may be regarded as a remnant of embryotic organization. Its most frequent situation is the anterolateral part of the neck. Like the ordinary fistule, it may terminate in a cul-de-sac, or it may have two orifices, of which the external is sometimes scarcely visible. The abnormal passage itself is usually very narrow, and seldom extends beyond two or three lines in depth.

# CHAPTER XV.

## TRANSFORMATIONS.

**The Body in a state of constant Mutation.—Number of Transformations: the Cellular, Mucous, Cutaneous, Fibrous, Cartilaginous, Osseous and Adipose.**

If we trace the human body through the various stages of its existence, it will be found that it is incessantly undergoing changes, by which the nutrition of its elementary constituents is modified, until they are at length converted into totally different structures. During infancy and adolescence, entire organs, now no longer of any use in the economy, change their characters, and are either completely absorbed, or revert to their primitive condition. Thus the thymus gland, which at birth is so large as to cover the whole of the anterior surface of the pericardium, and which consists of a considerable number of distinct lobes, gradually shrinks into cellular tissue, and finally, about the age of thirty, entirely disappears.

The term transformation is employed to designate those changes which a pre-existing tissue undergoes, as it is being converted into another that is totally different from it, but which has its analogue in the animal economy.

Viewed in this light, the number of transformations is really very small, and may be stated as follows: 1. The cellular. 2. The mucous. 3. The cutaneous. 4. The fibrous. 5. The cartilaginous. 6. The osseous. 7. The adipose. To each of these transformations it will be necessary to devote separate consideration; premising that they occur most frequently in old age, and that they are all effected under the influence of inflammatory irritation. How far the latter proposition is true, will appear by and by.

1. The *cellular* transformation, on the whole, is much less frequent than some of the others. The best illustrations of it are to be found in the peritoneum, the adventitious membranes, the gall-bladder, and the ligaments. The gubernaculum also affords a good example of it. This band, which is intrusted with the office of conducting the testicle from the lumbar region to the scrotum, is of a fibrous nature, which it retains until it has effected the purpose of its creation, when it gradually shrinks into cellular substance. During its descent, the organ in question likewise drags along with it a portion of peritoneum. This process forms an elongated cul-de-sac, somewhat like the finger

of a glove, which occupies the inguinal canal, lying in front of the spermatic cord, to which, and to the testicle, it closely adheres. When the descent is completed, the canal is by degrees closed up, and the portion of peritoneum alluded to degenerates into cellular tissue, whilst that over the testicle remains still a serous cavity.

The ligaments, especially the capsular, are sometimes converted into cellular substance. The metamorphosis is most marked in young persons affected with unreduced luxations of the hip and shoulder-joints. In such cases it is not rare to find the ligaments of a dull white color, deprived of their fibrous arrangement, and transformed into lax cellular structures. The same thing is occasionally observed in the extremity of an obliterated artery, and in the coats of the gall-bladder, when it is obliged to suspend its functions from some permanent obstruction of its excretory duct. The adventitious serous membranes, particularly the band-like, are often transformed into cellular tissue, more frequently in the pleuritic and pericardiac cavities than in any other situations.

2. Considering the close connection between the mucous and cutaneous tissues, their similarity of organization and of function, it is not surprising that the one should be convertible into the other. With regard to the former, which serves to line the various outlets of the body, it has only to be exposed to the atmosphere and to repeated friction, and, sooner or later, it will be transformed into *skin*, or, at least, into a substance so nearly resembling it, that it would be difficult to point out any difference between them. The process by which this is accomplished is gradual, and requires some time for its completion. The first thing that is noticed in the exposed membrane is a change of color, which progressively diminishes in intensity, until at length it approaches that of the external cutaneous surface. Whilst this blanching is going forward, the part loses its accustomed sensibility, augments in thickness and density, and becomes covered with a horny lamella, corresponding with the epidermis. Its absorbing powers are also much lessened, and, instead of mucus, it pours out a thin, watery fluid, analogous to the cutaneous perspiration. This transformation, however, is at best imperfect; and it remains to be shown whether it really consists of the same number of layers as the natural skin.

3. The cutaneous texture is the only one, it appears to me, which is, strictly speaking, susceptible of the *mucous* transformation. In order to bring this about, the process above described should be, as it were, reversed; that is, the skin should be inverted, and excluded from the influence of the atmosphere. Soon after this is done, the epidermis is observed to drop off, and the true skin assumes a deep, florid aspect, becomes extremely sensitive as well as somewhat rough, and deposits a thin, ropy, whitish fluid, in all respects similar to mucus. Analogous phenomena are often witnessed in corpulent persons, especially in infants, who suffer from chafes in the neck, groin, and armpit, from neglect of cleanliness.

4. Cases occasionally occur in which an opportunity is afforded for observing what is termed the *fibrous* transformation. The tissues most liable to be thus affected are the cellular, serous, and vascular, together

with the muscular and pseudo-membranous. In whatever situation it occurs, it is in the cellular element that it probably always begins, from which it gradually extends to and involves other textures, its progress being slow or rapid, according to the nature of the affected part, and the intensity of the exciting cause.

In some instances this transformation would seem to be of a physiological kind, taking place in parts that have ceased to perform their functions. Of this description are the vessels which are concerned in carrying on the fœtal circulation. These vessels, during intra-uterine life, are of the same structure precisely as the rest of the vascular system, of which they form so many appendages; but no sooner is the child detached from its mother than they are rendered useless, and instead of continuing hollow, which could answer no good purpose, they are gradually closed, and converted into dense, fibrous cords, in which it is impossible to recognize the slightest trace of the original structure. The process which is thus at work is of an inflammatory character, and serves the double purpose of obliterating these superannuated vessels, and metamorphosing their tunics.

5. Next to the osseous, there is no transformation of such frequent occurrence as the *cartilaginous*. This usually appears in the form of thin plates or nodules, which possess many of the properties, both physical and vital, of the tissue from which they obtain their name. Of all the textures, the subserous cellular seems to be the one that is most subject to this species of transformation. It is also frequent in the fibrous envelops of the spleen, especially in the inferior animals, in the placenta, the gall-bladder, the parietes of accidental cysts, in adventitious membranes, and in the walls of abscesses and of tuberculous excavations. It is rare in the submucous cellular tissue. The new substance cuts precisely like a piece of costal cartilage, and passes by insensible gradations into the circumjacent cellular tissue, which is generally unnaturally thick and indurated. Recent researches have shown that it is generally in reality devoid of all the elements of cartilage. It mostly consists of very dense fibrous tissue, and might, therefore, not inappropriately be classed with the fibrous transformations.

6. The most common transformation, by far, is the *osseous*. Although it has been described as occurring in all the tissues, even the nervous and muscular, it is now well ascertained that it is confined exclusively to the cellular, fibrous, fibro-cartilaginous, and cartilaginous, the frequency with which it takes place being in the order here enumerated. The new substance, which often bears but a very faint resemblance to natural bone, makes its appearance under three principal varieties of form, the lamellated, tuberoid, and spicular. Of these the first is the most common. It is usually met with in the subserous cellular tissue of the chest, abdomen, cerebro-spinal canal, and testicle, where it occasionally forms patches of considerable size, of a pale yellowish color, and from the third of a line to the twelfth of an inch in thickness. It is also seen in the walls of accidental serous cysts, in the interior of fibrous tumors, in the thyroid gland, and in the coats of the arteries. When the patches are numerous, they sometimes

coalesce, and thus form a sort of osseous membrane. In this manner I have often seen the largest arteries converted into hard, rigid tubes; and I have a specimen of diseased thyroid gland, which is reduced to a perfect bony shell, the interior being occupied by a soft, cretaceous substance.

The second variety, the tuberoid, is most common in the brain, the parenchymatous organs, and in the interior of serous cavities, whether natural or accidental. The number of concretions, although sometimes considerable, is generally small, not exceeding ten or fifteen. In the lungs, however, as many as five or six hundred have been found in a single subject. Varying in size between a clover-seed and a walnut, they are usually about the volume of a cherry-stone, of an irregularly spherical shape, more or less brittle, and of a pale straw color: in some instances, they are perfectly smooth, and of a pearly opaline lustre. Whether occurring alone or in groups, they are either inclosed by distinct cysts, or they lie in immediate contact with the tissues or cavities in which they are formed.

Instead of occurring in plates or granules, the accidental substance occasionally appears in the form of little *spicules*, resembling so many stalactites. Varying in length from a few lines to an inch or more, they are rarely thicker than a crow-quill, and are most commonly met with in the subserous cellular tissue of the brain and spinal cord, in the periosteum, and in the cellular tissue between the muscles. This variety, on the whole, is much less frequent than either of the other two.

With respect to its consistence, the osseous tissue, if it be really entitled to this appellation, is subject to much variety. In the great falx of the dura mater, I have frequently found it as dense and solid as the petrous portion of the temporal bone; in most other situations, however, it is much softer, and often remarkably brittle. Chemically examined, it is found, like the natural osseous tissue, to be composed of the phosphate and carbonate of lime, in combination with animal matter. The relative proportions of these constituents are extremely variable, and it not unfrequently happens that one of them is totally absent. In fact, in the majority of cases, this so termed osseous transformation does not present the usual uniform characters of true bone. It is rather a calcareous degeneration, or a deposit of chalky particles, with an absence of the natural elements of bone. This is especially observed in the ossification of arteries, and in that of the valves of the left side of the heart; it is also seen in the parietes of serous cysts. At other times the character of the ossified parts, even in the structures mentioned, is that of imperfect bone. A transformation presenting the well-marked minute features of osseous tissue is seen in the dura mater and arachnoid membrane, and, in advancing age, in the cartilages of the ribs and joints. In fibrous tumors, sheaths, and cellular tissue bone is generally not very perfectly formed.

When ossification takes place in the above structures, it will be found to present a series of successive stages, corresponding to those observed in the ossification of parts of the fœtal skeleton. The first change which this substance experiences is a diminution of its natural transparency, accompanied with a slight degree of thickening of the part, and a deposition of turbid, cream-like matter, which is diffused through its areolar texture. As the morbid process advances, the part becomes more and more opaque, is rendered flexible and elastic, assumes a grayish color, and grates under the scalpel. It is now distinctly fibro-cartilaginous; it is next converted into cartilage, and finally into bone, the particles of osseous matter being deposited at different points, which gradually augment in diameter, and at length, running into each other, thus completely change the primitive character of the part. The period required for the perfection of each of these changes cannot be determined.

Such, in a few words, is the process which nature ordinarily employs to accomplish this transformation; I say ordinarily, for there are cases, as every one knows, in which the process is much less complicated, and in which the osseous matter is deposited without any antecedent alteration in the structure of the part.

Accidental ossification is frequently witnessed in old age. There are very few persons, beyond the fiftieth year, in whom the arteries, together with the costal and laryngeal cartilages, are not thus affected. In other cases, it is directly chargeable to inflammation, sometimes of an acute, but mostly of a chronic nature. The ossification of the pleura in pulmonary phthisis, of the vaginal tunic in old hydroceles, and of the arachnoid in chronic hydrocephalus, is justly referable to this cause and to no other. So also with regard to the ossification of the periosteum during the formation of callus, of the walls of old abscesses, and the linings of tubercular excavations of the lungs.

7. The most remarkable transformation, perhaps, of all, is the *adipose*, in which, by the aid of the microscope, the tissues are seen to undergo a real fatty degeneration. In the majority of cases, indeed, it is a true replacement of tissue by oil. By some the alteration is supposed to consist essentially in the superaddition of fatty matter to the existing tissues, whilst others consider it as the result of a true transformation, the same in principle as the fibrous, cartilaginous, or osseous. Whatever doubts may still exist upon the subject, it seems to me that both views are, to a certain extent, correct. At all events, my own observations have fully convinced me that there are cases in which the fatty matter is literally infiltrated into the interstices of the different organs, imparting to them a greasy color and consistence. On the other hand, I am equally certain that a transformation, properly so called, of this kind takes place in different structures, especially in the liver, kidneys, pancreas, heart, and muscles, parts in which it is most frequently witnessed. An organ that is thus affected is generally of a pale straw-color, is diminished rather than increased in consistence, is easily torn, receives the impression of the finger, greases the scalpel which is used in cutting it, is of lighter specific gravity than in the natural state, and contains from one-third to one-half its own weight of yellow concrete oil. Such being the changes which ordinarily attend this transformation, the question next presents itself, how are they brought about? In the liver of the inferior animals, as will be shown in another place, this degeneration can often be produced at will,

simply by subjecting them to rest in a dark apartment, and cramming their stomachs with rich, stimulating food, which, by creating obstruction in the portal circle, in all probability induces inflammation in the hepatic tissues. In the human subject it is occasionally connected with general hypertrophy of the adipose tissue, and instances are observed in which it appears to depend upon the want of exercise of the affected part. The latter opinion is entitled to consideration chiefly from what occurs in the muscles of the inferior extremities of old persons who have long labored under paralysis. In such cases, the muscles often assume a pale color, are remarkably soft and flaccid, and exude a clear, oily fluid on pressure, their fibres, however, remaining perfectly distinct. But are these effects really attributable to the repose in which these parts, under the circumstances referred to, are placed? Would it not be more philosophical, in the absence of more satisfactory evidence, to conclude that something was due to the want of nervous influence, and to the altered state of the circulation thence arising? Be this as it may, I feel disposed to think that the transformation in question is uniformly the result of a low and imperceptible grade of inflammatory irritation. The subject, however, requires further investigation.

---

# CHAPTER XVI.

## PNEUMATOSIS, OR COLLECTIONS OF AËRIFORM FLUIDS.

Definition.—Frequency.—Names by which it is known.—Form and Extent.— Physical and Chemical Properties.—Causes.—Effects on neighboring Organs.—Most frequent in the Female.—Duration.—May be expelled or absorbed.

THE term pneumatosis is employed to designate a class of affections which consist in the introduction, development, accumulation, or exhalation of air, gas, wind, or aëriform fluids in the various organs, tissues and cavities of the body. Collections of this kind were noticed by different observers at a very early period of the profession, and are much more common than is generally supposed. They occur in various parts of the body, exhibit much variety as to degree and extent, give rise to very serious and sometimes even fatal effects, and are frequently so obscure in their character as to be mistaken for other affections.

Various *epithets*, derived for the most part from the anatomical name of the affected organ, tissue, or cavity, have long been employed to designate these gasiform collections. Thus, when the disease is seated in the chest, it is denominated pneumo-thorax; in the abdomen, tympanitis; in the uterus, physometra; in the heart-bag, pneumo-pericardium; in the scrotum and vaginal tunic, penumatocele; in the general cellular tissue, emphysema.

The *form* in which the effused air or gas appears is liable to considerable diversity, dependent chiefly upon the nature of the part affected. In the cellular substance it presents itself in the shape of a tumor, not prominent and circumscribed, but more or less diffused, soft, elastic, and emitting a peculiar crepitating or crackling sound on pressure. In the lung, where it constitutes one variety of emphysema, it occurs in narrow, bluish bands, or patches, from a line to half an inch or even an inch in breadth. When the aëriform fluid escapes into the cellular structure between the pleura and the lung it forms movable vesicles, blebs or bubbles, of a whitish, pearly appearance, and about the size of a currant or small bead. Similar phenomena take place in the vessels of the pia mater, in the cellular tissue between the pia mater and the arachnoid, and in the submucous cellular substance of the intestinal tube. In the first of these situations the air usually forms a congeries of transparent vesicles, which are rendered beautifully distinct by their contrast with the blood which not unfrequently separates them partially from each other. In the serous membranes the fluid is either extensively diffused, or it is confined by bands of plastic lymph to particular portions of these sacs, forming, so to speak, circumscribed windy bags.

In its *extent* the accumulation may vary from a few globules to many cubic inches. In the splanchnic cavities, particularly that of the abdomen, it may be so great as to lead to very serious distension of the walls by which they are inclosed, or of the organs which are contained in them. The bowels are sometimes puffed out many times beyond their natural dimensions; their muscular fibres are paralyzed; the function of defecation is suspended; and life is destroyed by the effects of the compression of the diaphragm and adjoining viscera. In the subcutaneous cellular tissue the quantity of effused fluid is sometimes very great, extending over an entire limb, one side of the trunk, or even the entire body. In the lung, submucous cellular tissue, and bloodvessels, the development is generally very small, sometimes hardly perceptible. Considerable quantities of gas are occasionally collected in the uterus, in the cellular substance of a mortified limb, and in the interior of a sphacelated hernia.

The *physical and chemical properties* of the aëriform fluid are influenced by a number of circumstances, of which the most important are, the period during which it is retained in the system, the absence or presence of disease in the part affected, and the nature of the concomitant effusion, whether this be serous, purulent, or bloody, alone, or in a state of combination. In the lungs and subcutaneous cellular tissue, where the extravasation is most commonly the result of some injury, the fluid is generally inodorous, perfectly transparent, and in all respects similar to the atmosphere from which it is originally derived. In the pleura and pericardium, in the uterus, in certain abscesses, and, above all, in the intestinal canal, it is often remarkably fetid, and charged with various kinds of gases—oxygen, hydrogen, nitrogen, and carbonic acid—the relative proportions of which vary much in different cases and in different circumstances. When the hydrogen predominates the fluid may be so thoroughly impregnated with it as to be inflammable; while, on the other hand, if there be a great redundancy of carbonic acid, it may be incapable of sustaining combustion, and readily extinguish a lighted taper. In the alimentary tube the fluid frequently contains a considerable quantity of sulphuretted hydrogen, and the same substance occasionally exists, though more sparingly, in the gaseous accumulations of the uterus, pleura, pericardium, and peritoneum. The air which is developed in scrofulous abscesses is sometimes remarkably fetid, probably from the same cause.

Considered in relation to the *causes* by which they are produced, and the morbid condition of the parts in which they are developed, aëriform accumulations may arise in a variety of ways, and under very different circumstances. Hence the several kinds of pneumatosis may with great propriety be arranged under the following heads: 1. Pneumatosis from the presence of a wound, laceration, or perforation; 2. Pneumatosis from the operation of chemical agents; 3. Pneumatosis from exhalation, or the influence of a true vital process.

1. Pneumatosis from external *injury* is most frequently noticed in the subcutaneous cellular tissue, where it sometimes occupies a great extent of surface, and forms, as was previously intimated, a soft, elastic swelling, emitting a peculiar crackling sound on pressure. The air, in consequence of the permeable nature of the structure in which it is lodged, may be readily pushed from one place to another, and often travels with great rapidity to points very remote from the one originally affected. Whether it experiences any changes in its chemical or physical properties in its passage, or during its sojourn, our information does not enable us to determine. Another form of this variety of pneumatosis occurs in the pulmonary tissue, usually from the rupture of the air-cells, and the consequent diffusion of the atmosphere through the connecting cellular substance. The appearance which the extravasated fluid presents here has been already pointed out. The air may remain in its original situation, or it may escape into the mediastinal cavity, and thence spread over the cellular tissue of the neck, head, and upper extremities. To the same class of affections belong the collections of aëriform fluids in the pleuritic cavity, from the ulceration of a bronchial tube. On this occurrence, which is by no means unfrequent, the air rushes into the cavity in question, where, if there be no adhesions of the contiguous serous surfaces, or considerable accumulation of serum, pus, or lymph, it may lead to severe compression of the pulmonary tissues, and so cause great embarrassment in the respiratory function. In perforation of the intestinal tube, whether occasioned by a wound or by ulcerative absorption, large quantities of air sometimes find their way into the peritoneal cavity, producing more or less distension of the abdomen, and a hollow, drum-like sound on percussion.

Finally, the air may be introduced directly from without through the natural inlets of the body, as the intestinal tube, the vagina, and the uterus. A considerable quantity of air constantly finds its way into the stomach along with our alimentary substances, and it is well known that many individuals possess the faculty of swallowing this fluid at pleasure. In the vagina, air may be drawn up into this tube while in a relaxed state, and afterwards explode with a considerable noise. The air may be retained for some time, or it may pass off soon after it has collected; it may be confined to the vagina, or it may ascend into the uterus, especially if the orifice and neck of that organ are unobstructed. Well-marked and even large accumulations of air are occasionally met with in the urinary bladder, probably from the direct introduction of the fluid through the urethra, though it may be difficult, especially in the male, to explain the manner in which this is effected.

2. The second class of causes, capable of producing pneumatosis, are of a *chemical* nature. Of this, the best examples are afforded by the uterus and vagina, in consequence of the retention of some extraneous substance, either solid, semi-solid, or liquid, as a piece of placenta, a portion of the fœtal membranes, a blighted ovum, a clot of blood, a mass of lymph or mucus, or the menstrual fluid. Whenever any substance of this kind is prevented from passing off, from the want of expulsive power of the womb, or the existence of some mechanical obstacle at the mouth or neck of that organ, it must necessarily undergo putrefactive decomposition, and thus give rise to the extrication of gas or air, usually more or less fetid in its character, and sometimes even inflammable. The quantity of gas evolved may be very considerable, or so trifling as to be scarcely perceptible; and the process upon which its elimination depends may continue in operation for several weeks, months, and even years.

Very considerable accumulations of gas sometimes take place from the partial decomposition of sero-purulent fluids. This phenomenon is most frequently noticed in the thoracic cavity, as a complication of chronic pleuritis; but may also occur in the pericardium, peritoneum, and even in the vaginal tunic of the testicle. To the same class of affections may be referred the aëriform fluids met with in scrofulous abscesses and in the sero-purulent collections of the larger joints, particularly that of the knee.

Another good example of this class of causes is afforded by what occurs in mortification. No sooner is a part, in a high state of inflammation, deprived of its vitality than it yields to the influence of the physical agents by which it is surrounded. Decomposition is speedily set up, and gas, usually of a highly offensive character, continues to be evolved until nature succeeds in casting off the slough. This variety of pneumatosis is frequently observed in sphacelated hernia, and sometimes, though more rarely, in mortification of the pleura and peritoneum.

The aëriform fluids which are developed in the stomach and bowels are generally produced under the influence of chemical decomposition. The food of man is extremely various in its nature, consisting as it does of a vast number of articles, both vegetable and animal; and hence it is not surprising that the gas which is extricated during digestion and the sojourn of the refuse matter in the intestinal tube, should often deviate in a remarkable manner from the normal standard.

Van Helmont long ago ascertained that the air contained in the large bowel is not unfrequently inflammable, while that in the stomach and small bowel rarely, if ever, possesses this property. The experiments of Jurine, Magendie, and Chevreul, show that the gas of the alimentary canal, in a state of health, is composed of azote, oxygen, hydrogen, and carbonic acid, the latter of which generally exists in greatest abundance in the colon and rectum, where there is also frequently a small amount of sulphuretted hydrogen. What changes, if any, this fluid experiences when there is derangement of the digestive function, has not been determined. We only know that, under these circumstances, it is often evolved in immense quantities, and with a rapidity truly astonishing.

3. It has been contended, thirdly, that the extrication of air, gas, or aëriform fluid, is occasionally the result of *vital* causes, or, in other words, of a process of secretion not unlike that of serosity, lymph, or pus. It is undeniable that pneumatosis often takes place in situations, and under circumstances, which altogether preclude the idea of its being derived in any other manner. The occasional existence of pneumo-thorax, of emphysema of the subcutaneous cellular substance, of pneumo-pericardium, of physometra, and of pneumatosis of the peritoneal cavity, has been attested by numerous pathologists. John Hunter, in his observations on digestion, long ago asserted, as an incontrovertible fact, that "air is either formed from the blood, or let loose by some action of the vessels, both naturally, and from disease;" and he has adduced the generation of wind within the cavity of the uterus as an evidence of the power possessed by the living organs of separating gaseous fluids from the blood. Since the time of this illustrious physiologist, numerous observations and experiments have been published, strongly corroborative, if not, in fact, conclusive, of this view of the subject. Krimer states that, having exposed the aorta of an animal whose circulation had been previously rendered exceedingly languid by the free use of digitalis, he included a portion of it, entirely emptied of its contents, between two ligatures, and on opening it some time afterwards found it full of air. Similar results may be produced by tying a loop of intestine. Gendrin[1] ascertained that, if inflammation of the villous coat of the bowel be excited by the application of diluted ammonia, boiling water, or alcohol, and the part isolated by ligatures, the inclosed portion will be found, on the subsequent day, in two cases out of five, to be distended by an inodorous gasiform fluid. Similar experiments have been performed, with the same results, by Sebastian, Siemens, and other pathologists.

The *effects* which gasiform accumulations exert upon the surrounding structures vary very much according to their extent and situation. In the alimentary tube, where they are more common than in any other part of the body, they often give rise to serious inconvenience, and sometimes even to loss of life. One of their earliest effects here is debility of the muscular fibres, which may finally end in complete paralysis, followed by excessive distension of the abdomen, and inability to evacuate the feces. When the accumulation is excessive, or protracted, the coats of the canal may become softened and even lacerated; an occurrence of which many examples are on record. Large collections of gas occasionally take place in the bowels from the presence of organic disease, spasmodic stricture, or hardened feces; and in such cases death may happen from over-distension of the alimentary tube, producing pressure upon the diaphragm to such a degree as to arrest respiration.

---

[1] Hist. Anat. des Inflammations, t. i. p. 582.

In the pleural sac the effused fluid may not only compress the lung, but even displace the heart. When the pericardium is distended, the contained organ will necessarily suffer more or less functional disturbance, though the air is probably in most cases speedily absorbed. In the uterus the accumulation of gaseous fluid may be mistaken for pregnancy, since it gives rise to more or less enlargement of the abdomen, and sometimes even to considerable swelling of the mammary glands. In general emphysema the movements of the body are impeded, and the patient occasionally perishes from the pressure excited by the effused fluid upon the vital organs.

Pneumatosis may occur in several situations at the same time, or, as it leaves one part of the body, it may make its appearance in another. It may exist as a separate and independent affection, or it may be complicated with other diseases, of which irritation and inflammation, with the various products of the latter, are the most common.

Spontaneous pneumatosis may occur in both sexes, and at any period of life, but is most frequent in women, about, or soon after, the decline of the menses. Various diseases predispose to it and persons of a weak, nervous habit are more liable to suffer from it than such as are strong and robust. The affection may be developed with great rapidity, but generally takes place gradually, and may last for a number of hours, several days, or even a much longer period. In some instances the generation of gas assumes an intermittent type, recurring in regular paroxysms once every twenty-four hours, or once every other day, like an intermittent fever. There seems occasionally to be a sort of *flatulent diathesis;* that is, the patient suffers habitually from windy accumulations of the stomach and bowels, so that he seldom knows what it is to be entirely free from colicky pains. It has also been supposed that pneumatosis may be hereditary, but of this we have no positive evidence.

Finally, the effused air may be discharged as fast as it is extricated; remain for some time, and then escape; or be retained permanently, as it were, and give rise to the bad effects already pointed out. Under favorable circumstances it may be absorbed, particularly when it is diffused through the cellular substance.

# CHAPTER XVII.

## POLYPES.

**Most common Situation.—Not peculiar to the Human Subject.—Number, Size, and Form.—Structure and Varieties.—Vesicular, Fibrous, Vascular, and Granular.—May degenerate in different ways.—Period of Life most liable to their Formation.—Effects on contiguous Structures.—True Character.—Are always covered by a Mucous Membrane.**

A POLYPE is a morbid growth, organized, vascular, and presenting itself in the form of a pendulous tumor, more or less firm, rarely exceeding the volume of a hen's egg, varying in structure and other properties in different parts of the body, and generally attached by a short neck or pedicle to the surface of a mucous membrane. The term is of Greek derivation, and was no doubt originally employed on account of the resemblance which this excrescence was supposed to bear to certain zoophytes. It is evidently not very appropriate, but as its import is fully understood by pathologists it would only occasion confusion to change it.

Although all parts of the mucous system, with the exception, perhaps, of the gall-bladder, the ureters, and Fallopian tubes, are liable to these growths, yet there are some in which they are more frequently observed than in others. Their most common situation is unquestionably the nose; next in order is the uterus; then comes the maxillary sinus; then the rectum; and, finally, the vagina. In the alimentary canal, apart from the portion of it just specified, they are most frequent in the pharynx and the colon. They are occasionally met with in the larynx and trachea, frontal and sphenoidal sinuses, the gums, external ear, urinary bladder, lachrymal sac, urethra, and vulva; but their occurrence here is extremely rare.

Polypes are not peculiar to the human subject. They have been noticed in a number of the inferior animals, particularly the horse, ass, cow, and dog, in which their occurrence is by no means infrequent. Their most common situation in these quadrupeds, as in man, is the nose, uterus, and maxillary sinus.

The *number* of these bodies is much influenced by their structure, and by the nature of the cavity in which they are developed. The harder varieties are almost always solitary, while the softer are frequently multiple, or, what is the same thing, occur in groups or clusters, to the number sometimes of six or even a dozen. Cases, indeed, have been recorded in which there were as many as twenty or thirty. This, however, is rare. The nose is the part in which they are most numerous, though even here there is often not more than one. In the uterus, maxillary sinus, vagina, and alimentary canal; in fact, in most of the situations above specified they are usually solitary. In the rectum, however, as many as four have been observed in the same subject, and in the vagina they are sometimes quite numerous. Tumors of this kind occasionally co-exist in different parts of the body, particularly in the nose and uterus.

In their *size* polypes vary from that of a pea to that of an almond, a walnut, and even the fist. The soft varieties are usually much smaller than the hard, which now and then acquire an enormous volume. In the uterus a fibrous polype has been known to be as large as a child's head, or to measure from ten to fifteen inches in length by six or eight in breadth. In the nasal fossa, where they must necessarily be comparatively small, they frequently extend down into the pharynx, depressing the arch of the palate, and touching the root of the tongue. In the uterus they gradually pass into the vagina, and ultimately protrude at the vulva, from which they may descend many inches between the thighs. In the stomach they have been found more than eight inches in length by upwards of an inch in diameter. In the maxillary sinus, notwithstanding the firm and resisting character of its walls, they often acquire an immense size, especially when of a malignant nature.

The *form* of these vegetations, like their number, is greatly influenced by the cavity in which they are situated, and by the pressure which is exerted upon them by the surrounding structures. In the nose and uterus they are generally conical or globular, with a tolerably distinct pedicle, while in many other parts, as the stomach, pharynx, and bowels, they are cylindrical, or of the shape of a leech or earthworm. In the maxillary, frontal, and sphenoidal sinuses they become usually pretty accurately moulded to the form of the cavity in which they are developed, whatever may have been their original appearance. In a uterine polype in my private collection, the tumor bears a striking resemblance to a mushroom; the pedicle, which completely closes the orifice of the organ, is about an inch long, and terminates in a bulbous expansion, nearly fifteen lines in diameter. When of a globular figure, the polype commonly adheres by a tolerably broad base; but if conical or cylindroid, it is almost always provided with a well-marked pedicle, narrow neck, or footstalk, which is from half an inch to an inch or even two inches in length by several lines in diameter, rounded, and often of unequal thickness in different portions of its extent. Sometimes the pedicle is very much elongated, constituting what some of the French writers have denominated the "pendulous polype." Occasionally, two or three tumors grow from a single stalk, and in some instances, though they are rare, the free extremity of the polype has a bifid, grooved, fissured, knobby, or tuberculated arrangement.

In relation to their *structure*, polypes may be referred to four principal species, the vesicular, fibrous, vascular, and granular. To these some writers have added several others, as the sarcomatous, lardaceous, cartilaginous, osseous, and mixed; such a distinction, however, is obviously improper, inasmuch as all these formations are the result entirely of secondary changes, produced in these bodies by irritation, diseased action, or perverted nutrition.

The *vesicular*, gelatinoid, or cellular polype is most frequently observed in the nose, though it is also occasionally met with in the other mucous cavities. It is of a soft, spongy consistence, homogeneous, frequently semi-transparent, and usually of a grayish, yellowish, violet, or pale greenish color. The surface of the tumor may be perfectly smooth and uniform, but more commonly it is somewhat rough, lobulated, or divided into ridges; vessels, sometimes of considerable length and volume, often ramify over it in different directions, without apparently entering its interior. This variety of polype occurs either singly or in clusters, and consists essentially of a loose delicate cellular tissue. When punctured, a yellowish, whitish, or lactescent serosity escapes, slightly coagulable by heat, alcohol, and acids, and which, when examined microscopically, shows nucleated cells lying in a transparent or slightly granular blastema. Its form, which is commonly conical or globular, is greatly influenced by the cavity in which it is situated; it is generally supported by a well-marked neck or pedicle; grows with considerable rapidity; is devoid of sensibility; readily breaks under pressure; and is always hygrometric, expanding when the atmosphere is moist, and decreasing when it is dry. The vesicular polype bears no little resemblance, both in its color and consistence, to the common oyster, or a lump of hardened jelly. When extirpated it is very apt to be reproduced.

The *fibrous* polype is so named from its structure, which strongly resembles that of a fibrous tumor. Its most common seat is the uterus, but it likewise occurs in the maxillary sinus, in the nose, in the alimentary canal, and, perhaps, also, in some of the other mucous passages. It is distinguished by the extreme firmness of its texture, which equals that of tendon, fibrous membrane, or even fibro-cartilage. It exhibits a faintly striated, linear, or thread-like arrangement, and is composed of distinct filaments, which interlace with each other in various directions, and inclose a glutinous substance, the quantity of which is usually in an inverse ratio to the density of the morbid mass. A polype of this kind is more or less elastic, slightly, if at all, compressible, opaque, and of a pale reddish, lilac, or grayish color. Sometimes it has a marbled or mottled appearance, and occasionally it is almost as white as a fibrous membrane. It is generally supported by a tolerably broad base, instead of a narrow, rounded pedicle; possesses very little or no sensibility; has few bloodvessels; is covered by a reflection of the mucous membrane; grows very tardily, though it often acquires a large bulk; and is much more apt than the other species to degenerate into malignant disease. Different sections of it often exhibit different structures, and in a few instances it is found to contain one or more cavities, which are either empty, or filled with grumous blood, milky fluid, gelatinous matter, or fat and hair. The fibrous polype always occurs singly; never in groups or clusters, as is the case with the vesicular and granular.

The third species of polype is the *vascular*, which, in comparison with the vesicular and fibrous, is extremely rare. It is occasionally found in the nose and maxillary sinus, but is most common in the rectum, external ear, vagina, and uterus. It is of a soft spongy consistence, bleeds readily when touched or irritated, and is composed of a great number of vessels, which, intersecting each other in different directions, are supported by a cellular tissue in varying quantity and forms of development, and surrounded by a delicate mucous membrane. Its color is usually florid, deep red, or purple, especially when it is handled, compressed, or exposed to the air. In its size it varies from that of a cherry to that of a hickory-nut, a hen's egg, or even a moderate-sized fist. It rarely, however, acquires much bulk; and its growth, notwithstanding its vascularity, is usually slow, so that a number of years may elapse before it leads to much inconvenience.

The vascular polype is generally attached by a small pedicle, and is almost always of a conical, globular, or ovoidal form. A tolerably large artery, accompanied by one or two moderate-sized veins, usually passes along the pedicle, and ramifies through the substance of the tumor, which it pervades in every possible direction. Hence it is usually erectile during life, and more or less flaccid after death.

The *granular* polype, probably the least frequent of any, is chiefly found in the uterus, though it also occurs in the nasal fossæ, the larynx, and the urinary bladder. Appearing almost always in clusters, which are sometimes spread over a considerable extent of surface, it varies in size between a currant and a grape, and is suspended by a rounded, delicate pedicle, often not thicker than a hempen thread, and from an inch and a half to two inches in length. It is of a pale rose, whitish, or grayish color, homogeneous, granular, soft, inelastic, and looking, when cut, somewhat like glandular flesh, the incision being occasionally followed by the exudation of a very small quantity of serous fluid. The polype is very easily detached from the surface on which it grows; is covered by an exceedingly delicate membrane; increases very slowly in size; and is apt, if repeatedly irritated, to take on malignant action. No vessels are apparent to the naked eye, and, unless ulcerated, or otherwise diseased, it does not evince any sensibility.

The different forms of polypous tumors, of which I have now given a brief description, may, in consequence of disease, to which, in common with other morbid growths, they are more or less liable, undergo various *transformations*. The most common of these are the carcinomatous, lardaceous, fibro-cartilaginous, cartilaginous, osseous, and earthy. None of these, with the exception of the first two, pervade the entire tumor, but occur in isolated masses, with intervening portions of sound substance.

The fibrous polype is by far the most liable to take on malignant disease; and next to this is the granular. As to the other varieties, they are rarely, if ever, affected in this manner. When the tumor assumes this kind of action, it usually grows with great rapidity, extending in all directions, and breaking down everything before it. It is of a deep red, brown, or livid color, is traversed by large, tortuous vessels, and is extremely prone to bleed upon the slightest touch, or under the most trifling irritation. Its sensibility is much augmented; pains dart through it in various directions; the whole system deeply sympathizes; the countenance exhibits a sallow cadaverous aspect; the general health is rapidly undermined, and the patient, worn out by suffering, sinks into the grave; the tumor, in the meanwhile, having opened at various points, and thrown out fungous excrescences. Examined at this stage of the malady, the morbid mass is found to be of a soft, brain-like consistence in some parts, lardaceous, scirrhous, hæmatoid, fibrous, or fleshy in others; the whole presenting a strange combination of disease, in which the surrounding structures, bones, cartilages, muscles, nerves, and vessels are often inseparably blended.

The *period of life* most liable to these morbid growths varies according to their structure, and the nature of the cavity or canal in which they are developed. In the rectum, they are most common in children under ten years; in the uterus, between thirty and forty; in the nose, in young adults; in the larynx, in advanced life. From the fact that they have occasionally been observed within a few weeks or months after birth, it is probable that they may sometimes be congenital. It would also appear that the disease may occur in several members of the same family, whence it has been inferred that it might be hereditary; of which, however, there is not, as yet, sufficient evidence.

We have no statistical facts which enable us to determine whether one sex is more liable to these formations than the other; the probability, however, is, that they are more frequent in women than in men. We are equally ignorant respecting the influence exerted upon their production by temperament, occupation, climate, and season.

The *pathological effects* of polypes on contiguous structures vary according to the volume, form, and situation of the tumor. As long as they are inconsiderable they cause little trouble or inconvenience, except, perhaps, in the uterus, where even a small body of this kind may occasion profuse and repeated hemorrhage. In proportion as they increase in size they manifest a disposition to press upon the walls of the cavities in which they are confined, or, if these cavities have a natural outlet, to pass beyond them, and encroach upon the circumjacent parts. Thus, in the nose, they frequently extend backwards into the fauces, and forwards into the anterior nares, while above they may press upon the turbinated bones, laterally upon the upper jaw, and inferiorly upon the roof of the mouth. In the maxillary sinus, after having filled that chamber, they usually encroach upon the eye, lachrymal sac, nose, mouth, and face, thrusting them out of their natural position, and thus causing not only much deformity, but more or less functional disturbance. A polype of the nose produces mechanical obstruction, attended with difficulty of breathing and a change of voice, which is often hoarse or croaking, as if the individual was laboring under cold. In the larynx, excrescences of this kind occasion dyspnœa, alteration or extinction of the voice, suffocative paroxysms, and a sense of uneasiness and of constriction in the region of the part affected. In the rectum, a polypous tumor has been known to cause fatal obstruction, from retention of the feces.[1] In the bladder, the disease is attended with frequent micturition, along with temporary inability to void the urine, and is liable to be followed by the worst consequences.

In the uterus, the most important effect by far is excessive loss of blood. The hemorrhage, which is often very copious, recurs upon the slightest exertion, and usually persists, with various intermissions, until the foreign body is removed or expelled. The quantity of blood lost may amount to many ounces or even pounds. It may be discharged in a fluid state, or be retained for a time, and then come away in clots. A polype may also occasion prolapse of the womb, or even inversion, especially if it be attached to the fundus of the organ, and be of great weight, so as to lead to constant dragging and expulsive efforts. "The presence of a small polype does not prevent conception, although it renders the continuance of utero-gestation very doubtful, inasmuch as it frequently causes abortion." I have already referred to a tumor of this nature, of the shape of a mushroom, which so completely closed the mouth of the womb as to cut off all communication between the interior of that viscus and the vagina.

In regard to their origin, polypes cannot be viewed, strictly speaking, in the light of new formations, but rather as the result of a species of hypertrophy of the mucous membrane, either alone, or conjointly with the textures over which it lies, and to which it is more or less intimately attached. That this is the case may be easily proved by an examination of the anatomical elements of which these tumors are composed. Thus, the granular polype, as it is called, evidently consists of an enlargement of one or more of the mucous follicles, which everywhere exist in the mucous membranes, though much more numerously in some situations than in others. These little bodies are particularly abundant at the neck of the uterus, and hence the reason probably why this species of tumor is almost exclusively confined to this organ. When these glands are irritated or inflamed, their outlets become obstructed, either by the adhesive process, or from the retention of inspissated mucus, in consequence of which they augment in size, and gradually assume a pediculated appearance. In the meantime the mucous membrane of the uterus is prolongated over their outer surface, so as to give them a complete investment; vessels extend into them from different points of their circumference, and thus they continue to grow until they exhibit the peculiar form, color, consistence, and structure which characterize them. In its mode of development this variety of polype closely resembles that of an encysted tumor of the skin, which is caused by the obstruction of a sebaceous follicle, and the consequent accumulation and retention of its contents. The principal difference between them is, that the latter is not pediculated, owing to the resistance which it everywhere meets with from the cutaneous tissues, while the other, projecting into an open space, may readily expand in every direction, and by its weight and dragging produce the footstalk by which it is usually suspended.

---

[1] Meckel's Neues Archiv., B i.; Voigtel, Handbuch der Pathol. Anatomie, B. ii. p. 649.

The vesicular polype is probably, at least in most cases, nothing but a species of hypertrophy of the mucous membrane, with infiltration and induration of the submucous cellular substance. In the vascular variety of the disease there is a predominance of the vascular elements; the bloodvessels are increased in size, and protruded underneath the villous membrane, forming a soft, spongy, and erectile tumor, of a red, florid or purple color, and the seat of frequent hemorrhages. The mucous follicles have nothing to do with its production, and the cellular substance enters but sparingly into its composition; barely sufficient to connect the arterial and venous ramifications, and to form a framework for their distribution. In the fibrous polype there is a prolongation or hypertrophied state of the fibrous tissue of the part. In the uterus, where this species of the disease is remarkably frequent, it is not unlikely that a portion of the proper tissue of that organ is the structure originally concerned; in the nose, gums, and maxillary sinus it is probably the periosteum. Dr. Da Costa informs me that he has repeatedly, in addition to fibrous tissue, found smooth muscular fibres and fibre-cells in polypes of the uterus, especially well marked in those that appeared fleshy to the naked eye.

From the preceding account of the different species of polypes it will be perceived that all these vegetations are covered with a mucous membrane, which is merely a prolongation of that of the cavity or canal in which the foreign body is developed. This investment varies very much in its physical properties, according to the structure, size, and age of the tumor. In the fibrous polype it is usually of considerable thickness, opaque, rough, mammillated, tough at some points, and remarkably brittle at others; while in the vesicular, granular, and vascular it is comparatively thin, semi-transparent, or perfectly pellucid, smooth, glossy, and of tolerably uniform consistence throughout. In recent cases, and occasionally even when the tumor is of long standing and of considerable bulk, the membrane by which it is covered is a mere film, requiring the greatest care to demonstrate it. I am in possession of a polype of the rectum, evidently belonging to the vascular variety, which is studded all over with the finest villi, much more minute than those of the small bowel. In the carcinomatous form of the disease, the investing membrane is often remarkably thickened, highly vascular, rough, pulpy, and exceedingly fragile.

Polypes are well supplied with blood. In many cases, indeed, the vessels are not only quite apparent, but large, tortuous, and even varicose. The veins evidently predominate, both in volume and number, and their parietes are often so thin and brittle that they are scarcely able to sustain the pressure of the column of the contained blood. The largest usually ramify over the surface of the morbid product, immediately beneath the mucous membrane, to which they frequently impart a beautiful striated appearance. The arteries are comparatively small, and pervade the substance of the tumor in every direction, conveying to it the materials which are required for its growth and nourishment. Both classes of vessels are derived from the structures to which the polype is attached, and not from any formative or creative power of the abnormal body itself. No nerves or absorbents have been detected in these excrescences, but that they exist in them, and are derived in the same manner as the bloodvessels, does not admit of doubt, though we have no means of demonstrating the fact.

## CHAPTER XVIII.

### HYDATIDS.

**Historical Outline.—Where found.—Classification of Hydatids.—The Cysticercus, Polycephalus, Diceras, Echinococcus, and Acephalocystis.—Their Origin and Organization.—The manner in which they are nourished.—The Changes which they experience by Age, and the Alterations they induce in the Organs in which they are developed.**

The combined researches of naturalists and pathologists have shown that many of the higher orders of animals, as well as some of the lower, are infested with a class of beings, which are generally known, at the present day, by the name of hydatids. The term hydatid was formerly given to every encysted tumor containing a transparent fluid. It has, however, become customary to restrict it to those sacs which inclose entozoa, and it is in accordance with this view that I shall use the term. Their most common residence is in the serous cavities, the alimentary canal and the passages which open into it, the cellular tissue, among the muscles, and in the proper substance of the different organs. They have been found in nearly all classes of animals, in birds, reptiles, and fishes, as well as in a great many of the mammalia. Whether they exist in insects, has not been ascertained. No period of life is exempt from them. Portal mentions an instance of their having been detected in the fœtus. They are most common, however, in adults and old people.

So far as can be ascertained, these parasitic beings possess no genital organs, no apparatus for respiration, no trace of a circulation, and apparently no nerves. They can live and propagate their species only in the interior of other animals, and their existence is usually very brief, most of them perishing within the first year or two after they are developed, often much earlier. A few of them only are capable of performing distinct movements under the influence of external stimulants.

In describing these singular animalcules, I shall divide them into five genera: 1, the *cysticercus*; 2, the *polycephalus*; 3, the *diceras*; 4, the *echinococcus*; and, 5, the *acephalocystis*. Differing from each other in many essential points, it will be necessary to devote to each of these genera separate consideration. It may be premised, however, concerning them, that they all consist of a thin, pellucid vesicle, varying in size between a clover-seed and an orange, which is filled with a clear, watery fluid, and surrounded by a dense, fibrous capsule, upon which they depend for their nourishment and support.

The *cysticercus* is nearly cylindrical in shape, terminating behind in a caudal vesicle, whence its name. The whole animal is somewhat wrinkled, and its head, which strongly resembles that of the tape-worm, is furnished with hooks and suckers. This genus is more frequently met with in the inferior animals than in man, and is particularly common in the liver and brain of the sheep. Its size rarely exceeds a small walnut, and in most cases it is not near so large. It generally exists singly in the inclosing cyst, which is almost always thin, delicate, and transparent, except in old cases, or where the hydatid has lost its vitality, when it is apt to be thick, dense, semi-cartilaginous, or even bony. The body of the animal itself may degenerate and become covered with a chalky crust. In the sheep, in which this genus often acquires a large size, the caudal vesicle presents an infinite number of minute elevated lines, running nearly at right angles with the body of the animal. Five species of the cysticercus have been recognized by authors, the cellular, vesicular, dicystic, speckled, and Fischerian.

Fig. 23.

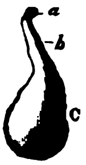


Fig. 24.

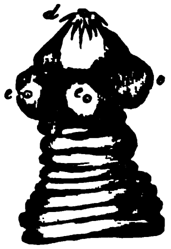


Fig. 25.

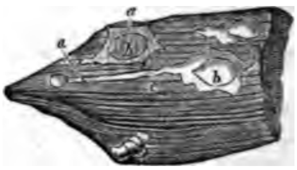


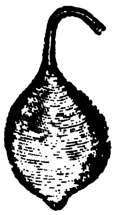
Fig. 23 exhibits the natural form of the animal: *a.* The head; *b.* The neck, and *c.* The dilated vesicular tail.

Fig. 21 shows the head in a magnified state: *d.* The proboscis; *e, e, e.* The suctorious disks.

Fig. 25. A portion of human muscle with the cysticercus inclosed: *a, a.* The cyst cut open; *b, b.* The parasite; *c.* The muscle.

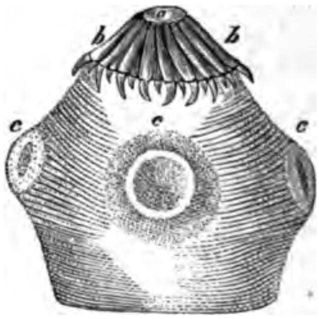
The *cellular cysticerce* (Figs. 23, 24, and 25) is met with mainly in the hog, in which it occasions the disease commonly known under the

Fig. 26.



The natural form of the parasite.

Fig. 27.



The head, as it appears under the microscope: *a.* The flattened promontory; *b, b.* The hooklets; and *c, c, c.* The suckers.

name of *measles*, or what the German writers call *finnen*. It has been rarely observed in the human subject. The body is conoidal, from four to ten lines in length, and composed of a thin, transparent membrane, without any perceptible fibres: the caudal bladder is of an oval shape, and the head, which is tetragonal, is furnished with four suckers, together with thirty-two hooks divided into two rows.

The *vesicular* species (Figs. 26 and 27), which is also very rare in man, having been found only in a single instance in the choroid plexus of an apoplectic subject, has hitherto been chiefly observed in the ox, sheep, swine, goat, stag, and gazelle. The peritoneum, pleura, and arachnoid are the situations in which it delights to dwell. Its head, which is almost tetragonal, is armed with a cylindrical and slightly curved snout; the neck is quite short, the body small, and the caudal vesicle nearly spherical.

The third species (Figs. 28 and 29) is the *dicystis*, or, as this term literally signifies, the double-bladder hydatid. Laennec is the only person who has observed this worm. He found it in the lateral ventricles of a man who had died of apoplexy. It consists of two large vesicles, of which one is caudal, whilst the other, which is annulated and of a conical shape, forms the body. Both are traversed by a wide canal, which terminates anteriorly in a cul-de-sac. The head has four suckers, and a certain but indeterminate number of hooks.

Fig. 28.

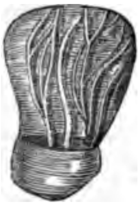


Fig. 29.

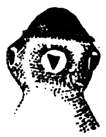


Fig. 28 is the dicystis of the natural size.

Fig. 29 the magnified head.

The *speckled cysticerce* (Fig. 30) has a head with one sucker and six hooks; the body is conical, nearly transparent, and from four to eight lines long; the caudal bladder is spherical and irregularly dotted with very small white points. It has been met with only in one instance, by Treutler, in the choroid plexus of a young woman.

The *Fischerian species* (Fig. 31) has a rounded, slender, annulated body, and a large head furnished with an indeterminate number of hooks and suckers. The caudal bladder, which is pear-shaped, is about the fourth of an inch long, and terminates in a small point, which adheres to the organ which the animal inhabits. It is said to have no inclosing cyst. Dr. Fischer, of Leipsic, after whom it is named, detected it twice in the choroid plexus of the human subject.

Fig. 30.

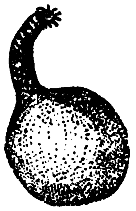
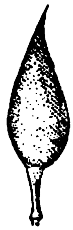


Fig. 31.



The second genus, the *polycephalus*, is extremely rare, and has not, up to the present time, so far at least as I am aware, been found in man. It is composed of a semi-transparent cyst, speckled with minute, opaque whitish spots, and is of a somewhat oval figure; it is generally very small, and is provided, as the derivation of the name indicates, with a great number of heads. The situations which it generally occupies in the inferior animals are the brain, liver, and intermuscular cellular tissue. Two species have been noticed by authors, the *cerebral* and the *granular* (Figs. 32 and 33), which, however, as they never occur in the human subject, need not be described.

Fig. 32.

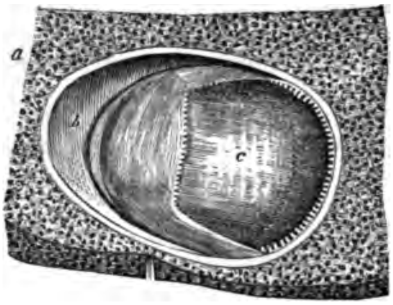


Fig. 33.

Fig. 34.

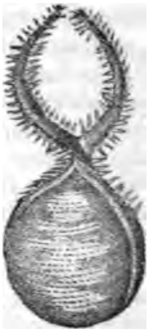


**Fig. 32 exhibits the granular polycephalus imbedded in the liver of the sheep: *a.* The hepatic tissue; *b.* A portion of the cyst; *c.* The parasite cut open.**

**Fig. 33 is a small body attached to the inner surface of the animal.**

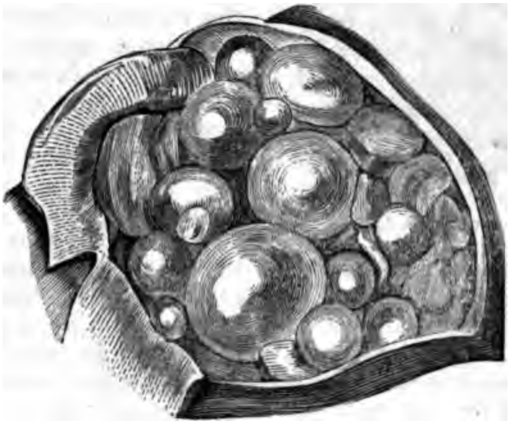
The *diceras*, a genus established by Sulzer, infests the alimentary canal of animals, and also occasionally that of the human subject. The German author here mentioned first observed it in the alvine evacuations of a young woman after having taken some purgative medicine. This genus, which embraces only one species, the *rough diceras* (Fig. 34), is distinguished by its flat, oval body, which is about a line and a half long, and terminated in a point posteriorly, and by the rough, bifid horn which surmounts its head, and from which the animal derives its name. It is loosely inclosed by a capsule. As yet it has not been discovered in the substance of any of the viscera. Of the diceras, I have never seen any specimens, and suspect it to be very uncommon. Rudolphi, indeed, appears altogether to doubt its existence; a view which has since become the most prevalent.

The fourth genus (Fig. 35), the *echinococcus*, was first suggested by Rudolphi, but is not admitted by Cuvier. Occurring principally in the brain, liver, spleen, and omentum, it consists of a capsule, analogous in structure to that of the acephalocyst, attached to the inner surface of which are numerous animalcules, of an ovoidal shape, extremely fine, granulated, and provided with four suckers and a crown of hooklets. The echinococcus is occasionally found in the human subject. Zeder discovered some in the brain of a young woman, occupying the third and fourth ventricles; they were about twelve in number, pyriform, and quite small. Müller has described an instance in which they were voided with the urine, by a man laboring under renal disease. But the most extraordinary case, perhaps, on record, is that published by Rendtorf. The sac containing the hydatids was developed in the brain; it was of large size, and weighed upwards of two pounds. The walls of

Fig. 35.

the right ventricle, in which it was situated, were so attenuated as to be scarcely a line and a half in thickness. The name by which this genus is designated, has reference to the rounded form of the body, and to the little asperities on its surface.

Fig. 36.



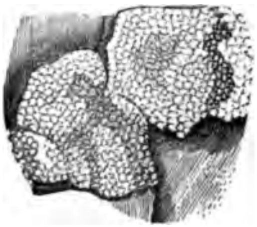
Acephalocyst.

The fifth genus, the *acephalocystis* (Fig. 36), by far the most interesting and common of all, was founded by Laennec, who published a very accurate account of it, in 1804, in his excellent "Memoir on Vesicular Worms." Occurring both in the human subject and in many of the inferior animals, the individuals of this class of parasites infest some organs much more frequently than others. They seem to have a remarkable predilection for the liver, owing, probably, to some peculiarity of structure favorable to their development. The brain, ovary, uterus, mammary gland, spleen, and kidney are also sometimes their seat; in fact, they have been found in every part of the body, except the alimentary canal and urinary bladder.

Varying in size between a mustard-seed and a large orange, they are generally of a spherical figure, and composed of a white, semi-opaque, pulpy vesicle, filled with a clear, limpid fluid. This vesicle, which forms the hydatid, properly so called, is from the sixth of a line to the eighth of an inch in thickness, is often separable into two or more layers, and is so exceedingly delicate as to yield under the slightest pressure of the finger. So weak, indeed, is it, that it is frequently incapable of withstanding the pressure even of its own contents, as I have had repeated opportunities of witnessing, after the partial removal of the inclosing cyst. On being ruptured, it shrinks into a soft, irregular, puply mass, of an opaline color, which readily swims in water, and bears the greatest resemblance to the white of a hard-boiled egg. M. Collard states that it consists of two principal ingredients, one of which is essentially albuminous, whilst the other, the precise nature of which is not known, has a considerable analogy with mucus.

To the inner surface of the vesicle now described are often attached extremely minute bodies (Fig. 37), not bigger than the finest grain of sand, of a grayish color, and a spherical shape, which are young hydatids. In some instances they are connected with the exterior of the parent sac; but this is very rare. It has been made the basis, however, of the division of acephalocysts into two species, the endogenous and exogenous, the former being most common in the human subject, the latter in the ox and other ruminant animals. The animalcules at first line the inner layer of the vesicle. In what manner, or how soon after their formation, they are cast off, are circumstances in their history concerning which we are ignorant. All that is known with any certainty is, that they may often be seen floating about in great numbers, while they are scarcely the two-hundredth part of an inch in diameter, which would lead us to infer that they are generally detached at a very early period of their existence. When the hydatid, as often happens, consists of several coats, the generation sometimes takes place between them, or even in their substance. In whatever way it is accomplished, a small opaque elevation, easily distinguishable by the eye, usually indicates the spot where the young have been developed.

Fig. 37.



Young acephalocysts.

It sometimes happens, though not very often, that a large acephalocyst contains several that are smaller, one within the other, all of the same shape and structure. As many as three, four, and even five, have been found thus inclosed, like so many pill-boxes. This arrangement, which occurs much oftener in the human subject than in the inferior animals, is explained by the endogenous mode of generation previously adverted to, by which one acephalocyst, after having arrived at maturity, produces another, each successive one being smaller than its parent.

The inclosing cyst of this species of hydatid is usually semi-transparent, very strong and dense, and has no connection whatever with the parasite within. In fact, there is commonly interposed between them a soft, pulpy, dirty-looking substance, arranged in a thin, unequal lamella. The thickness of the outer capsule varies a good deal with the size and age of the tumor: it can occasionally be separated into several layers, and may be said to possess all the properties of the fibrous tissue, without any of its linear disposition. It is probable that these acephalocysts of Laennec are nothing but echinococci, whose bodies have become hydropic, so that these two genera may possibly soon be cast into one.

Such is a rapid sketch of the most common genera and species of hydatids. Let us now inquire briefly into their origin and organization, the manner in which they are nourished, the changes they experience from age, and the alterations they induce in the tissues in which they are developed.

The origin of hydatids is involved in doubt and conjecture. An idea was at one time entertained that they were the result of inflammation. Recent researches tend to show that they are the ova of worms, probably of the tænia, which reach a certain stage of development, and then become encysted, or may themselves become hydropic. In dogs and rabbits fed with these cysticerci and echinococci, tænia were subsequently found; and, on the other hand, the embryos of tænia have been seen perforating the intestinal walls, in order to reach the parenchymatous structures in which they were destined to become imbedded.

Whilst the formative process is going forward, the parasite takes care to isolate itself from the parts in which it is developed, by means of a capsule, which surrounds and protects it from injury. This capsule, formed out of plastic lymph, is furnished with appropriate vessels as well as, in all probability, with nerves and absorbents. Many of these vessels, which are so large that they can be readily injected, are spread out in beautiful arborescent lines. So far as I have had an opportunity of examining them—and I have often done this in the acephalocyst of the hog—they appear to be derived principally from the surrounding textures. Nevertheless, there are certain situations in which they are plainly the result of new formation, as in the ventricles of the brain, the serous sacs, the ovaries, and the uterus. Nowhere can any of their branches be traced from the outer covering into the walls of the hydatid itself.

The proper hydatid contains, as was before stated, a thin, aqueous fluid, which, so long as the animal remains healthy, is generally perfectly clear and limpid, like the purest spring-water. Under opposite circumstances, it is frequently turbid and discolored, or entirely replaced by purulent matter, blood, or other substance. Be this as it may, the fluid is usually remarkably saline in its taste, possesses little or no odor, and rarely, if ever, coagulates by exposure to heat, alcohol, corrosive sublimate, or the dilute acids. In several experiments which I made on the contents of some very large acephalocysts of the liver of the hog, heat produced not the slightest change; and similar results ensued in a trial which I made on a hydatid taken from the liver of a man forty years old. These results accord with the researches of Marcet, Cruveilhier, and other writers; and they point out the great resemblance of this fluid to that of hydrocephalus, in its want of coagulability, in consequence of the almost total destitution of albumen.

How are hydatids nourished? or, rather, whence do they derive the materials necessary for their support? It has been already seen that they are completely isolated from the tissues in which they are developed by means of a capsule which has no immediate connection with them, and the inner surface of which, moreover, particularly in the acephalocystic genus, is generally lined by a thin, pulpy, fragile lamella, which adds still further to the isolation. This intervening substance is supposed by Dr. Hodgkin to be a sort of excrementitious secretion from the hydatid itself: I, on the other hand, would rather conclude, in the absence of facts, that it is an important structure, designed to assist in the elaboration of a fluid for nourishing the parasite. This fluid, which is probably of a sero-albuminous character, and is furnished by the vessels of the inclosing capsule, is filtered through the soft, pulpy matter here adverted to, and is finally imbibed by the proper cyst of the hydatid, which it thus enables to live and to execute its humble functions; those, namely, of secreting a thin, watery liquid, and of propagating its species. All this, of course, is conjectural; nevertheless, the argument might easily be sustained by analogy, the only kind of proof that can be adduced in illustration of an inquiry environed by so many difficulties.

Many hydatids appear to be short-lived. This is especially true of the acephalocysts of some of the inferior animals, as the sheep and swine, in which they are said to be produced in the spring, and to perish the following winter. In others, again, as well as in the human subject, they last for years, and often acquire a large bulk. Their existence is greatly influenced by the nature of the tissues in which they are developed, as well as by their number and size. Not unfrequently an old hydatid is destroyed by its young, which press upon and finally rupture it. In a second series of cases, death comes on without any assignable cause; the contained fluid gradually disappearing, and the proper cyst, as well as the inclosing capsule, becoming collapsed, opaque, corrugated, and of a yellowish amber color. In a third series the parasite is attacked with inflammation. When acute, this disease sometimes ends in a species of gangrene; but more generally in suppuration. Of both these terminations I have had occasion to observe a considerable number of instances. In the former case, the fluid is of a turbid appearance, and the cysts, both proper and adventitious, are converted into a soft, brownish mass, which is sometimes quite offensive. In the latter, that is, when the inflammation ends in suppuration, the contained liquid is often entirely absorbed, its place being occupied by a yellowish, gold-colored pus, of a thick, plastic consistence, slightly saline to the taste, and of a faint animal odor. This occurrence is most frequently witnessed, according to my experience, in old acephalocysts, and in most of the cases that I have examined the internal membrane was either wholly destroyed, or broken up into fragments, mixed with the abnormal secretions.

When the inflammation is chronic it is not uncommon for the inclosing capsule to become thickened, indurated, and fibrous, from the deposition of lymph. Occasionally it puts on exactly the appearances of the interior of a large aneurismal sac; cases have also been observed where it was rendered cartilaginous, and even bony. The ossification usually begins by a few central points, which gradually augment in diameter, until, in some instances, they coalesce with each other, and form considerable sized patches.

A hydatid has been known to be the seat of apoplexy. The only instance of this kind that I remember to have read of, is that mentioned by Dr. Hodgkin, in his morbid anatomy of the serous membranes: it occurred in a man forty years old. The hydatid was seated in the neighborhood of the spleen, and was externally of a dark color, which arose from a thin layer of blood interposed between the proper and the inclosing cyst.

Hydatids may prove mischievous in two ways; first by their great number, and, secondly, by their large size. In either case they are apt, sooner or later, to excite inflammation in the parts in which they are situated, which may terminate in suppuration, softening, gangrene, induration, or, finally, in ulceration. The hardest structures are sometimes incapable of withstanding their progress. Thus, a case is recorded in which they perforated the scapula. When seated in the abdominal viscera, they are often passed by stool, ejected by vomiting, or discharged externally through a fistulous aperture. In the lungs, hundreds are sometimes coughed up by the same patient; in the kidneys they have been known to be voided with the urine, either entirely, or in small fragments. In the brain, they may become a source of epilepsy, paralysis, or destructive softening; while, in the serous cavities, their escape is occasionally attended with fatal inflammation.

# CHAPTER XIX.

## SEROUS CYSTS.

Have the form of Shut Sacs.—Organs in which they are most frequently found.—Classification: the Simple, Multilocular, and the Included.—Nature of the Contained Fluid.—Are either new Products, or formed out of the pre-existing Textures.—Are liable to Inflammation and its Consequences.

MUCH more simple in their structure, as well as much less obscure in their mode of origin, than hydatids, are those membranous pouches which have received from morbid anatomists the name of serous cysts. Deriving their generic distinction from their contents, which are usually of an aqueous character, they constitute a class of adventitious textures, which, like those naturally existing in the splanchnic cavities, form perfectly shut sacs, rough and adherent on one surface, smooth and in contact with a fluid on the other. Their shape is globular, ovoidal, pear-like, or pediculated, and in size they observe every intermediate degree between a grain of mustard and a large melon. As far as can be ascertained, they are, with few exceptions, the result of an entirely new formation, dependent upon the effusion and organization of plastic lymph. With the mechanism of this creative process, as with that of hydatids and other accidental growths, we are altogether unacquainted; nor is it possible always to appreciate the different morbid lesions which precede and accompany it; that it proceeds, however, under the influence of causes which excite inflammation in the normal tissues, is a fact borne out both by observation and analogy.

Like hydatids, with which they are often confounded, serous cysts are found either upon the free surfaces in the natural cavities, or in the proper substance of the organs. They have been observed in almost all classes of animals; and, although no period of life can be said to be exempt from them, yet they are much more frequently seen in the old than in the young, and, according to my own experience, in the female than in the male. They may be considered as living at the expense, and in the interior, of other structures, more perfectly organ-liquid, and of propagating its species. All this, of course, is conjectural; nevertheless, the argument might easily be sustained by analogy, the only kind of proof that can be adduced in illustration of an inquiry environed by so many difficulties.

Many hydatids appear to be short-lived. This is especially true of the acephalocysts of some of the inferior animals, as the sheep and swine, in which they are said to be produced in the spring, and to perish the following winter. In others, again, as well as in the human subject, they last for years, and often acquire a large bulk. Their existence is greatly influenced by the nature of the tissues in which they are developed, as well as by their number and size. Not unfrequently an old hydatid is destroyed by its young, which press upon and finally rupture it. In a second series of cases, death comes on without any assignable cause; the contained fluid gradually disappearing, and the proper cyst, as well as the inclosing capsule, becoming collapsed, opaque, corrugated, and of a yellowish amber color. In a third series the parasite is attacked with inflammation. When acute, this disease sometimes ends in a species of gangrene; but more generally in suppuration. Of both these terminations I have had occasion to observe a considerable number of instances. In the former case, the fluid is of a turbid appearance, and the cysts, both proper and adventitious, are converted into a soft, brownish mass, which is sometimes quite offensive. In the latter, that is, when the inflammation ends in suppuration, the contained liquid is often entirely absorbed, its place being occupied by a yellowish, gold-colored pus, of a thick, plastic consistence, slightly saline to the taste, and of a faint animal odor. This occurrence is most frequently witnessed, according to my experience, in old acephalocysts, and in most of the cases that I have examined the internal membrane was either wholly destroyed, or broken up into fragments, mixed with the abnormal secretions.

When the inflammation is chronic it is not uncommon for the inclosing capsule to become thickened, indurated, and fibrous, from the deposition of lymph. Occasionally it puts on exactly the appearances of the interior of a large aneurismal sac; cases have also been observed where it was rendered cartilaginous, and even bony. The ossification usually begins by a few central points, which gradually augment in diameter, until, in some instances, they coalesce with each other, and form considerable sized patches.

A hydatid has been known to be the seat of apoplexy. The only instance of this kind that I remember to have read of, is that mentioned by Dr. Hodgkin, in his morbid anatomy of the serous membranes: it occurred in a man forty years old. The hydatid was seated in the neighborhood of the spleen, and was externally of a dark color, which arose from a thin layer of blood interposed between the proper and the inclosing cyst.

Hydatids may prove mischievous in two ways; first by their great number, and, secondly, by their large size. In either case they are apt, sooner or later, to excite inflammation in the parts in which they are situated, which may terminate in suppuration, softening, gangrene, induration, or, finally, in ulceration. The hardest structures are sometimes incapable of withstanding their progress. Thus, a case is recorded in which they perforated the scapula. When seated in the abdominal viscera, they are often passed by stool, ejected by vomiting, or discharged externally through a fistulous aperture. In the lungs, hundreds are sometimes coughed up by the same patient; in the kidneys they have been known to be voided with the urine, either entirely, or in small fragments. In the brain, they may become a source of epilepsy, paralysis, or destructive softening; while, in the serous cavities, their escape is occasionally attended with fatal inflammation.

## CHAPTER XIX.

### SEROUS CYSTS.

**Have the form of Shut Sacs.—Organs in which they are most frequently found.—Classification: the Simple, Multilocular, and the Included.—Nature of the Contained Fluid.—Are either new Products, or formed out of the pre-existing Textures.—Are liable to Inflammation and its Consequences.**

MUCH more simple in their structure, as well as much less obscure in their mode of origin, than hydatids, are those membranous pouches which have received from morbid anatomists the name of serous cysts. Deriving their generic distinction from their contents, which are usually of an aqueous character, they constitute a class of adventitious textures, which, like those naturally existing in the splanchnic cavities, form perfectly shut sacs, rough and adherent on one surface, smooth and in contact with a fluid on the other. Their shape is globular, ovoidal, pear-like, or pediculated, and in size they observe every intermediate degree between a grain of mustard and a large melon. As far as can be ascertained, they are, with few exceptions, the result of an entirely new formation, dependent upon the effusion and organization of plastic lymph. With the mechanism of this creative process, as with that of hydatids and other accidental growths, we are altogether unacquainted; nor is it possible always to appreciate the different morbid lesions which precede and accompany it; that it proceeds, however, under the influence of causes which excite inflammation in the normal tissues, is a fact borne out both by observation and analogy.

Like hydatids, with which they are often confounded, serous cysts are found either upon the free surfaces in the natural cavities, or in the proper substance of the organs. They have been observed in almost all classes of animals; and, although no period of life can be said to be exempt from them, yet they are much more frequently seen in the old than in the young, and, according to my own experience, in the female than in the male. They may be considered as living at the expense, and in the interior, of other structures, more perfectly organized than themselves, which afford them protection and the means of subsistence. Their occurrence is extremely common, both in man and in ruminating animals; and it has even been contended that they occasionally manifest a hereditary tendency, the greater portion of a large family having been known to be thus affected during several successive generations. They have been found in nearly every structure and cavity of the body, but particularly in the ovaries, the liver, kidneys, the mammæ, and the testicles. They are also not infrequent in the brain of old persons; but they are seldom seen in the spleen, heart, lungs, and pancreas. In the vessels, the fibrous membranes, ligaments, cartilages, and mucous outlets, they have not, I believe, been noticed.

*Structure.*—Viewed in reference to their structure, these adventitious sacs may be divided into three classes, the simple, multilocular, and included. Before we proceed to speak of these in detail, it will be proper to offer a few remarks concerning their contents. Like the natural serous membranes, the sacs in question, when once formed, or even whilst they are in progress of development, enjoy a life of their own, and are susceptible of various morbid actions, either set up in their substance or propagated to them from the surrounding normal textures. So long as they remain healthy, or in the exercise of the functions which nature has assigned to them, the fluid which they secrete, and which occupies their interior, is of a thin, watery consistence, clear and limpid, somewhat saline in its taste, and more or less coagulable by heat, alcohol, and acids. As to quantity, it ranges according to the size of the morbid growth, from a single drop to many ounces or even quarts. When affected with disease, the contents of the cysts are variously altered, often presenting appearances which are not to be observed under similar circumstances in the normal serous textures. The most interesting of these changes will be adverted to in another paragraph.

The *simple cyst*, the type of the whole series, consists of a thin, delicate sac, generally of a globular figure, the interior of which is occupied, in the healthy state, by a pellucid fluid possessing all the properties of the serum of the blood. Composed of a single lamella, it is usually perfectly transparent, is seldom bigger than an orange, and is supplied with very long, slender vessels, which are evidently derived, in all cases, from the circumjacent parts. It is from these vessels, which are often extremely numerous, and spread out in a most beautiful arborescent manner, that the cyst obtains its nutriment and the materials from which it prepares its contents. They are probably accompanied by nerves and absorbents; but these, if they exist, are so excessively minute as to elude our closest scrutiny; and hence no anatomist has ever succeeded in tracing them. The parts in which this variety is most frequently developed are the internal organs of reproduction in the female, particularly the ovaries and the fimbriated extremities of the Fallopian tubes, the liver, and the brain, in the lateral ventricles of which, along the choroid plexus of old subjects, they often occur in clusters of ten, twenty, or thirty at a time, the largest not exceeding a common currant.

Advancing a step higher in the scale of complexity, we come to the second division of the subject, the *multilocular cyst.* The principal difference between this and the preceding variety consists in the cellulated structure which is to be found in the former, and in the entire absence of it in the latter. This arrangement, from which the present accidental growth derives its name, is produced by a variable number of membranous processes, which are attached to the inner surface of the main cyst, and extend inward so as to intersect each other in different directions. In this way numerous compartments are formed, of varying size and shape, which sometimes communicate together, at other times are perfectly distinct. The most curious circumstance connected with these chambers is, that they often contain different kinds of substances. Thus, one may be occupied by perfectly limpid serum, a second by pure blood, a third by pus, and a fourth, perhaps, by fatty, melicerous or atheromatous matter. The reason of this cannot be easily explained; we might naturally expect to find it in some difference of structure; but, in the majority of cases, no such difference exists; and we are therefore forced to conclude that the phenomenon depends merely upon a modification of secretion.

This variety of cyst is most commonly found in the cerebral substance around old apoplectic effusions. It is also frequently seen in ovarian tumors, and in the subcutaneous cellular tissue, in parts which are constantly subjected to pressure, as the shoulders of porters and the knees of chamber-maids. In its shape, the multilocular cyst is generally irregular, its walls are of unequal thickness, and its internal processes are often rough and uneven.

The third variety, the *included*, much less frequent than either of the others, is characterized by the circumstance of the main cyst, which is commonly of an irregular shape, containing clusters of smaller ones attached to different points of its inner surface. The number of included vesicles is sometimes truly surprising, many hundreds being found in the same specimen, from the volume of a grain of mustard to that of a hickory-nut; they are mostly of a globular form, and are composed each of a single lamella, which is continuous with, and appears to be merely a reflection from, the original sac, which not unfrequently contains several series of these junior cysts. On cutting into them, they are found to be occupied, in the great majority of instances, by a serous fluid, in others by a matter resembling the white of eggs, thin starch, or a solution of gum Arabic; or all these substances may occur at the same time, filling different cavities. When the interior vesicles are large or numerous, they sometimes completely distend the main cyst, rendering it rough and protuberant, and occasionally even bursting it; after which, being no longer repressed, they often grow with extraordinary rapidity.

These cysts are apt to be confounded with hydatids; but may be readily distinguished by the fact of their being all intimately connected with the parent sac, by the circumstance of vessels passing from the one to the other, and by their not containing any parasitic formations. The parts in which these cysts are most frequently met with, and in which they acquire the largest size, are the ovaries and the broad ligaments of the uterus. In most cases they are, as was previously stated, of a globular form; but it is by no means unusual for them to present a pediculated appearance, especially the binary and tertiary orders.

Thus, there are three distinct varieties of serous cysts, all referable to three general modes of formation, the first being the most simple, the third the most complicated, the other being intermediate between them. In other words, the first consists of a simple sac, filled with a serous fluid; the second, of a sac which is intersected by more or less numerous processes; and the third, of a sac which contains clusters of smaller ones, precisely of the same shape and structure as itself.

It has been seen that these different classes of cysts are the result, in most instances, of an entirely new formation, dependent upon a perverted state of the nutritive function. In other cases, they appear to be formed out of pre-existing textures, sometimes of a serous, at other times of a mucous nature. To the former category belong the cysts which are so often found in the ovaries, in consequence of the enlargement of the vesicles of De Graaf; to the latter, those which are developed in the kidneys and in the female breasts, from obstruction of the excretory ducts. In these situations it is not uncommon for the adventitious growth to receive an accidental covering from the organ in which it is located. In the ovaries, for example, we accordingly find that the cyst is usually provided with very thick, dense parietes, separable into three distinct layers, the internal of which consists of the capsule of the vesicle of De Graaf, the second of the albugineous coat, and the third of the perĭtoneal covering of the organ. The same thing is sometimes observed in the spleen and liver. It is worthy of remark that, when the cyst is formed out of pre-existing mucous membrane, as in the instances above referred to, it generally, in the course of a short period, assumes all the properties of the serous textures.

Serous cysts, whether of new formation, or constructed out of the pre existing tissues, are liable to inflammation, and, when thus affected, they may present all the phenomena which characterize this disease in other parts of the body. The contained fluid, in such cases, is generally thick, turbid, and discolored, owing to the presence of substances which do not naturally belong to it. Occasionally it has the aspect and consistence of coffee-grounds, thin treacle, or tar; and the instances are by no means unusual in which it possesses all the properties of genuine pus. A fatty matter has also been found in it, as well as a substance resembling cholesterine. The cyst itself may be variously affected. Generally speaking, it is opaque, grayish, dense, and fibrous, being thicker and stronger at some points than at others. The examples are rare in which the cyst is eroded, or transformed into cartilage or bone. The alterations which it creates in the parts where it is situated need not be particularly described, as they do not differ from those induced by hydatids.

# CHAPTER XX.

## HETEROLOGOUS FORMATIONS.

**Preliminary Observations.—Classification; Tubercle; Melanosis; Scirrhus; Encephaloid; Colloid; Epithelial Cancer.—I. *Tubercle*.—Definition.—Great frequency.—Occurs nearly in all Tissues, and at all Periods of Life.—Is common in the lower Animals.—Chemical Composition.—Varieties of Form.—Concrete and semi-concrete Tubercular Matter.—Notions respecting its Origin, Development, and Organization.—Softening and Excavations.—II. *Melanosis*.—Historical Sketch.—Occurs in Man and Animals.—Chemical Analysis.—Color and Consistence.—Varieties of Form.—Tissues most liable to suffer from Melanotic Diathesis.—States of the System which predispose to its formation.—III. *Scirrhus*.—Difficulty of the Subject.—Definition.—Varieties of Form.—Chemical Constitution.—Rarely appears before the age of thirty.—Most common in Glandular Organs.—Proximate cause.—Opinions of Adams, Carmichael, Hodgkin, and others.—Is apt to Ulcerate and involve the general System —IV. *Encephaloid*.—Is intimately allied to Scirrhus.—Terms by which it has been designated.—More frequent in some Structures than in others.—Varieties of Form.—Color, Consistence, and Composition.—Organization and Mode of Origin.—A Disease of early Life.—Involves the whole System.—Termination.—V. *Colloid*.—First described by Laennec.—Different Names.—Is a distinct Formation.—Composed of two Elements.—Microscopical Characters.—Cellular Tissue, Vessels, and Nerves.—Chemical Constitution.—Varieties of Form.—Most common Situation.—Most frequent from Thirty-five to Fifty.—Mode of Origin and Progress.—VI. *Epithelial Cancer*.—Its Nature, Organization, and Tendency.**

BY the term heterologous are understood certain morbid products, of a solid or semi-concrete consistence, which have no resemblance whatever, or, at most, only a very remote one, to the natural, normal, or pre-existing tissues of the body. It is of Greek derivation, literally signifying unlike, dissimilar, or without analogy, and is employed by many as synonymous with the word heteroclite, first devised, I believe, by some of the German anatomists.

The number of heterologous products has been variously stated by writers, but it admits of much doubt whether there are really more than six, namely, the tubercular, scirrhous, encephaloid, colloid, melanotic, and epithelial. To these might, perhaps, be added the parasitic animals which are developed in different parts of the body, such as worms and hydatids, and the calcareous concretions which are found in certain cavities and canals, as the urinary bladder, ureters, intestinal tube, and veins. Cirrhosis, sclerosis, and some other morbid appearances, comprised under the present head by Laennec and Beclard, are evidently foreign to it, and must therefore be excluded. Any arrangement, however, that may be offered in the present state of the science must, from the very nature of the subject, be imperfect, and susceptible of further improvement. Indeed, I am not certain that the term heterologous, as applied to these formations, is not altogether ill-chosen, and out of place, since most of them are found, when carefully investigated, to have a very close resemblance, in many of their most essential features, to the normal tissues of the body.

Although the heterologous formations, properly so called, are not of equal frequency, yet they all have one common tendency, namely, to destroy, sooner or later, the structures in which they are located. Hence the propriety of the term malignant, under which some of them have long been noticed by authors, and from which arrangement, from some unaccountable circumstance, tubercle has hitherto been excluded. Not only, indeed, is this disease malignant, but, if we reflect upon the rapidity of its progress, and its extraordinay fatality, it must unquestionably be regarded as the most malignant of all the heteroclite formations of which we have any knowledge. The period during which the morbid deposits remain, varies from a few months to several years; a circumstance which, together with the several changes which they themselves undergo, and which they exert upon the structures in which they are located, will be fully adverted to in the following sections.

These morbid products occur at all periods of life, in both sexes, and in nearly all the organs and tissues of the body. Their origin, although still enveloped in obscurity, is probably of an inflammatory nature, attended with an altered condition of the blood, and an aberration of the nutritive function.

## SECTION I.

### TUBERCLE.

Of all the heterologous formations, the most interesting, unquestionably, is the tubercular, whether it be viewed in reference to its frequency, the obscurity which still envelops its nature, or the great attention which it has always elicited from the medical philosopher. Occurring at all periods of life, from the most tender infancy to the most decrepid old age, it is the cause, in all probability, of nearly one-third[1] of all the deaths that annually happen throughout the world. If this be true, as the data which we have, though still very imperfect, would lead us to infer, it will be readily granted that a knowledge of this disease must be of vast importance to the practitioner, and worthy of his most profound investigation.

The term tubercle was anciently applied, in a very vague manner, to almost every kind of tumor, no matter what was its situation, form, consistence, or composition. The confusion concerning the character of this and other morbid products, thus introduced in the infancy of the science, prevailed during more than twenty centuries, and is still, there is reason to believe, sufficiently common. The definitions which have been given of this term are almost as numerous as the authors who have written upon the disease. It is of Latin derivation, and literally implies a little swelling. In the sense in which I shall here use it, it denotes a small, solid tumor, of an irregularly spherical figure, more or less opaque, of a pale yellowish color, seldom exceeding the volume of a pea, and composed of a peculiar substance, which, sooner or later, undergoes a process of decomposition. This definition, however, does not embrace more than two of the varieties of form in which the tubercular matter is deposited; and it is rather in compliance with the established custom of pathological writers, than the rules of sound criticism, that I restrict the meaning of the word within these narrow limits.

---

[1] The greater part of this mortality is caused directly by pulmonary phthisis; the rest by tubercles of the lymphatic ganglions, the spleen, the serous membranes, and the bones.

*Situation.*—There is hardly an organ in the body in which tubercular matter is not occasionally deposited. Nevertheless, it is much more common in some situations than in others. The lungs, lymphatic ganglions, the spleen, peritoneum, the mucous follicles of the alimentary canal, the liver, the spongy texture of the bones, and the adventitious membranes of the splanchnic cavities, are particularly distinguished by the frequency with which this disease originates in them. Of these parts, again, the summits of the lungs and the lymphatic ganglions, especially the bronchial and mesenteric, are most liable to suffer; for the reason, probably, that they naturally possess a very languid circulation, and are therefore proportionably prone to inflammatory congestion.

The matter may be deposited upon the free surface of the different membranes, both natural and adventitious, in the cellular tissue, and in the parenchymatous substance of the various organs. In the lungs it is much more frequently witnessed in the air-cells than in the connecting cellular tissue. In the lymphatic ganglions, where tubercular disease is nearly as common as in the lungs, it is always deposited in the interstitial substance. In the liver and kidney the matter may occur upon the surface of these organs, or in their interior; in the former case it is developed in the parenchymatous texture, in the latter generally in the mucous lining of the excretory canals. In the brain, where there is scarcely any cellular tissue in a free state, the heteroclite substance is deposited in the cerebral texture.

The site of tubercular disease is influenced, in a very considerable degree, by the age of the individual. This is a circumstance which, from its practical bearing, is deserving of further attention. The three following tables afford an account of the localization of this heterologous deposit in children and in adults. The first is constructed from the excellent memoir of Dr. Lombard, of Geneva, and is founded on 100 careful autopsic inspections.

TABLE I.

| | | | |
|---|---|---|---|
| Bronchial ganglions | 87 times. | Gastro-hepatic ganglion | 5 times. |
| Lungs | 73 " | Subperitoneal cellular tissue | 5 " |
| Mesenteric ganglions | 31 " | Inguinal ganglions | 3 " |
| Spleen | 25 " | Subpleural cellular substance | 2 " |
| Kidneys | 11 " | Lumbar ganglions | 1 " |
| Intestines | 9 " | Urinary bladder | 1 " |
| Nervous centres | 9 " | Omentum | 1 " |
| Cervical ganglions | 7 " | Gall-bladder | 1 " |
| Cerebral envelops | 6 " | False membranes of the pleura | 1 " |
| Pancreas | 5 " | | |

The second table is by Rilliet and Barthez,[1] and shows the comparative frequency of tubercular deposits in different organs, in three hundred and fourteen children between the first and fifteenth year.

TABLE II.

| | | | |
|---|---|---|---|
| Lungs | in 265 cases. | Liver | 71 cases. |
| Bronchial ganglions | 249 " | Large intestines | 60 " |
| Mesenteric ganglions | 144 " | Membranes of the brain | 52 " |
| Small intestines | 134 " | Kidneys | 49 " |
| Pleura | 109 " | Brain | 37 " |
| Spleen | 107 " | Stomach | 21 " |
| Peritoneum | 86 " | Pericardium and heart | 10 " |

The third table is compiled from the treatise of Louis, and refers to 358 cases of tubercular disease after the age of fifteen. A comparison of this with the materials furnished by Lombard and by Rilliet and Barthez, will show the occurrence of the morbid deposit in different organs in the two periods of life.

TABLE III.

| | |
|---|---|
| Lungs | 357, or in all except 1 |
| Small intestines | about $\frac{1}{3}$ |
| Large bowel | " $\frac{1}{5}$ |
| Mesenteric ganglions | " $\frac{1}{4}$ |
| Cervical ganglions | " $\frac{1}{10}$ |
| Lumbar ganglions | $\frac{1}{12}$ |
| Prostate gland | $\frac{1}{13}$ |
| Spleen | $\frac{1}{14}$ |
| Ovaries | $\frac{1}{20}$ |
| Kidneys | $\frac{1}{40}$ |

In the above cases, the uterus was affected only once, the brain twice, the ureter once, the liver twice, and the supra-renal capsules twice.

The inference deducible from these tables is, first, that, in children, tubercles not unfrequently occur in different parts of the body, without existing in the lungs; secondly, that they are more liable to affect the lymphatic ganglions than in adults; and, thirdly, that they have a tendency to attack a much greater number of organs simultaneously or successively. It is a singular circumstance that the spleen is seldom tuberculized in adults, whilst it is very often affected in children, in the proportion nearly of one to four. From the tables of Louis and

---

[1] Traité des Maladies des Enfans, t. iii.

Lombard, but particularly from that of the latter, it would appear that the liver is remarkably exempt from this disease at all periods of life; a result which is, however, strikingly at variance with the statement of Rilliet and Barthez, who found this organ affected seventy-one times in three hundred and fourteen cases. Papavoine observed the liver tuberculized in more than one-fourth of his autopsies, or in fourteen children out of fifty. The intestines are affected with nearly equal frequency at both periods of life.

*Period of Life.*—The time of life most liable to tubercle is between twenty and forty. No age, however, is exempt from it, and it occasionally exists as an intra-uterine malady. Chaussier has related several cases of miliary tubercles in the lungs of the fœtus; and similar examples have been published by others. In one case, the infant was stillborn at the seventh month, and the tubercles, seated in the pulmonary tissue, were in a softened state.[1] The late Dr. Morton, of this city, also met with this disease at a very early age. Many years ago my friend, Dr. Rives, of Cincinnati, found the lungs of an infant, six weeks old, crowded with miliary tubercles, many being in a state of suppuration. I have myself twice observed this disease in children under three months of age, and under circumstances which rendered it almost certain that the heteroclite matter had been deposited either before or immediately after birth. On the whole, however, there is sufficient ground for concluding that tubercles are of comparatively rare occurrence in the fœtus and infant. Rilliet and Barthez find that in children this disease is most frequent from six to ten years and a half, then from eleven to fifteen, next from two to five, and lastly from one to two and a half. Louis, as already stated, has ascertained, from the analysis and comparison of 358 cases, that after the age of fifteen tubercles never occur in any organ in the body, unless they also exist in the lungs. To this statement, which may be regarded as a law, there are, of course, exceptions, but they are too few to affect its general accuracy. Another law, the universality of which is nearly equal to that just mentioned, is, that in children tubercles are secreted more rapidly and in greater abundance than in adults.

*Occurs in Inferior Animals.*—Tubercles are not peculiar to the human race. They have been observed in many species of animals, in birds, reptiles, and even in insects; though, as respects the latter, facts are still wanting to illustrate the subject. Amongst quadrupeds they have been noticed in the ape and monkey, the horse, ox, elk, deer, and antelope, the dromedary, sheep, goat, hog, bear, lynx, dog, lion, tiger, cat, squirrel, and rabbit; amongst birds, in several species of macaws and parrots, the turkey, hen, sparrow, and flamingo; amongst reptiles, in the serpent, frog, and turtle.[2] In all these various classes of beings, the morbid deposit presents the closest analogy to that observed in the human subject, and is likewise more frequently seen in the lungs than in any other organ. Nor is it limited to any particular period of life. It is very frequently witnessed in the youngest animals, and

---

[1] Cless, Am. Journ. Med. Sci., N. S., x. p. 249.

[2] Clark on Consumption and Scrofula, p. 212. London, 1838.

Dupuy has met with it even in the fœtus of the sheep and rabbit. In lambs, from two to five months old, I have often seen the liver and lungs crowded with miliary tubercles.

It is a singular fact, and one not without its value in a practical point of view, that most of the wild and domesticated animals become affected with tubercles after a certain period of their confinement. Many of the quadrupeds that are imported into this country, and exhibited in our menageries, die from this cause. The dairy cows of Paris and other large cities of Europe, deprived of all exercise, and incessantly pent up in sheds, are extremely liable to suffer from this disease in various organs. Tubercles may be produced at pleasure in animals simply by shutting them out from the open air, by making them breathe a damp, unwholesome atmosphere, and by feeding them on indigestible, deficient, or innutritious aliment. Jenner, Baron, and Carswell induced the disease in this way in a few weeks in the lungs and liver of the rabbit.

*Chemical Constitution.*—The composition of tubercular matter has been frequently studied, but with no very satisfactory results. In fact, the greatest contrariety of opinion still prevails on the subject. Thenard found one hundred parts of crude tubercular matter to consist of—

| | |
|---|---|
| Albumen | 98 |
| Muriate of soda | 0.15 |
| Phosphate of lime<br>Carbonate of lime | 1.85 |
| Oxide of iron, a trace. | |
| | 100 |

Lombard discovered in crude tubercle ninety-eight parts of animal matter, and only two parts of salts. Chalky tubercle, on the contrary, contained ninety-six parts of salts, and scarcely four of animal matter. These results have been confirmed by the analysis of L'Heritier, who found in hardened tubercle from five to nine per cent. of animal substance, and from ninety-one to ninety-five of carbonate and phosphate of lime. The animal matter consists, according to some chemists, of combinations of proteine. Thus, Vogel states tubercle to consist of fibrin, albumen, casein, fat and extractive matters, a substance resembling pyine, and different salts.

The discrepancies in the results of the above analyses may be accounted for by supposing that the chemical constitution of tubercular matter varies, as no doubt it does, not only in the different stages of its existence, but also in different individuals, in different situations, and in different parts even of the same organ. It is reasonable to conclude, also, that it is modified, more or less, by the state of the solids and fluids, or, in other words, by the cachexy, or constitutional peculiarity leading to its formation. In all these respects tubercular matter bears the closest resemblance to serum, lymph, and pus, which are often remarkably altered in their chemical and physical properties by the nature of the affected tissue, the state of the system, and the concomitant inflammation. In the inferior animals, the composition of this substance presents, perhaps, still greater variety than in the human subject. In the ox, there is always an unusual predominance of earthy salts, and hence the extraordinary brittleness which characterizes the morbid product. In the turtle I have seen the tubercular substance of the color and consistence of calcareous moss, or what, in mineralogical language, is termed tufa. In the sheep, horse, and some other quadrupeds, on the contrary, the animal matter is generally much greater than the saline, especially in the early stage of the disease.

*Varieties of Form.*—Tubercular matter presents itself under four distinct varieties of form, the miliary, encysted, infiltrated, and lamellated. Of these the first and last are the most frequent, both in man and in the inferior animals, and they all depend upon the condition of the organs and tissues in which they are developed.

The *miliary* variety, so called from its resemblance to a millet-seed, is by far the most common of all, and is the one from which the deposit derives its distinctive name.[1] It is usually of a rounded shape, but may be more or less flattened, ovoidal, or angular, according to the degree of compression exerted upon it by the parts in which it is situated. In its volume it varies from a pin-head to that of a pea. In the brain and liver it is sometimes as large as a cherry, a marble, or even a billiard-ball. It is opaque, inelastic, and of a pale yellowish color, either uniformly, or lighter at some points than at others. In some instances, it is grayish, reddish, deep-brown, blackish, speckled, bluish, opaline, or of a whitish pearly tint. Its consistence also is liable to much diversity. Thus it may be hard and dense like fibro-cartilage, caseiform, curdy and friable, soft, or almost semi-liquid. On account of the difference of color which these tubercles assume, as well as of their difference of consistency, some pathologists have described two varieties: the semitransparent grayish bodies or *gray* tubercle, in contradistinction to the larger or more friable yellowish masses or *yellow* tubercle. Both present, as will be shown hereafter, the same structure. The yellow tubercle contains, however, more oil, forms larger masses, and has a greater tendency to soften. The gray may become converted into the yellow tubercle.

The number of miliary tubercles varies from one to many thousand. In their early state they are perfectly isolated; but, as they augment in volume and number, they gradually approach each other, and ultimately coalesce, resembling, in this particular, the pustules of confluent smallpox. In this manner large masses are frequently formed, varying in density from the consistence of recent lymph to that of fibro-cartilage, and presenting an ovoidal, globular, polygonal, or stellated configuration. Tumors of this description seldom exceed the dimensions of a walnut; but they may attain the bulk of an orange, the fist, or even of a fœtal head. This variety of the tubercular deposit, although most common in the lungs and lymphatic ganglions, is often observed in other organs, especially the spleen, the serous membranes, the isolated follicles, the Peyerian glands, the kidney, and the liver. It also occurs in the spongy tissue of the bones, in the brain, testicle, prostate gland, pancreas, thymus gland, the uterus and ovaries.

---

[1] It has become customary of late to restrict the term miliary tubercle to very small isolated bodies. In my description, however, of this form of the deposit I include, also, the large masses which are formed by the union of the smaller.

The miliary tubercle is occasionally surrounded by a distinct capsule, constituting what is called the *encysted* variety. The envelop varies very much in its structure and appearance in different cases. On the peritoneum it generally presents itself in the form of a thin, transparent film, of excessive tenuity; more commonly, however, it is of a dense, fibrous nature, from the sixth of a line to a line in thickness, and of a pale grayish color; sometimes pink, violet, or mottled. Externally it is firmly attached to the parts in which it is developed, and from which it is often separated with difficulty. The tubercular matter itself is commonly of a grayish-yellow tint, opaque, interspersed with dark points, and closely adherent to the inner surface of the cyst. Both structures have probably a contemporaneous origin. This, however, is still a mooted question. In old tubercles the cyst is sometimes ossified. This variety of tubercle is very rare. The situations in which it is most commonly found are the peritoneum, lungs, spleen, brain, bones, and bronchial lymphatic ganglions.

A third variety of tubercular matter exists in the form of *infiltration*. It is often found around tubercular excavations, sometimes in considerable patches, of a grayish, or yellowish aspect, more or less dense, crisp, and firm, like cartilage. In its texture it is apparently homogeneous, presenting, when divided, a smooth, polished surface, in which it is impossible to discern the slightest trace of the original structure. The deposit has occasionally the aspect and consistence of jelly, and then constitutes the *gelatiniform infiltration* of Laennec. This form of tubercular secretion is exceedingly rare, and is principally observed in the lungs in connection with miliary tubercles, the intervals of which it occupies. The heteroclite matter is of a pale reddish, or grayish tint, verging on greenish. In its consistence it varies according to the period at which it is inspected; at first it is soft, semi-concrete, and almost tremulous; but at a more advanced stage it is denser and changes into the ordinary infiltrated tubercle. After an indefinite time both varieties of infiltration experience the same transmutations as the common miliary tubercle, the commencement of the degenerating process being announced by the formation of one or more opaque, yellowish points in the interior of the morbid mass.

The fourth variety is the *stratiform*, in which, as the name imports, the tubercular matter is deposited in the form of a layer, generally upon the free surface of the mucous membranes. Next to the miliary variety, this seems to be the most common in which this substance presents itself. It is occasionally met with in the bronchial tubes, but much oftener in the ureter and pelvis of the kidney, the uterus, and the seminal vesicles. The layer varies in thickness from that of a sheet of paper to a line, a quarter of an inch, or even half an inch, according to the capacity of the canal or reservoir in which it is situated. It is opaque, curdy, friable, and of a grayish, cineritious, or yellowish tint; it is generally very easily detached from the surface on which it lies, and seems to possess little or no plastic force. It is, in fact, essentially an effete, or excrementitial substance. When the matter is poured into the seminal vesicles, the uterus, ureter, or pelvis of the kidney, the lamellated arrangement is only well marked so long as the deposit is scanty; as soon as it becomes abundant, it assumes an amorphous, nodulated form, and may completely fill the containing cavity. The same arrangement occurs in the bronchial tubes, where the matter sometimes extends into the air-cells, forming small cauliflower-shaped expansions.

This variety of the tubercular deposit is not peculiar to the human subject. It has been repeatedly observed in the lower animals, as the cow, sheep, and rabbit, and I have myself seen it in the green turtle. The new substance, in this instance, occupied the bronchial canals, being arranged in long, cylindrical masses, and in thin, yellowish patches, of an irregular shape, and from five or six lines to several inches in diameter. In some of the tubes it was firm, tenacious, and separated with difficulty from the mucous surface; in others, it was remarkably brittle, dry, putty-like, and apparently unadherent. Many of the air-vesicles were entirely filled with it.

There is a form of tubercle which has attracted much notice, and which is known under the name of the *gray granulation.* It is of a very dense texture, grayish, or colorless, semi-transparent, rounded, ovoidal, or flattened, and from the size of a small pin-head or millet-seed to that of a currant, a pea, or a common cherry. When divided, it is perfectly homogeneous, and exhibits an opaline, shining, or vitreous appearance. It is sometimes invested by a delicate film-like cyst, and always greatly resembles, when first deposited, a globule or small mass of lymph.

The number of grayish granulations varies exceedingly. There may be only a few, perhaps, indeed, not more than one or two, or there may be hundreds, and even thousands, according to the size of the affected organ. There is, in fact, no limit in this respect. It is seldom that these little bodies coalesce, unless they exist in vast numbers, when they may unite, and form masses or nodules, equal, in some instances, in volume to a hen's egg, or even to a large apple. Whether isolated, or grouped, they always adhere with considerable pertinacity to the tissues immediately around them, and are frequently encircled by clusters of red vessels, some of which occasionally extend into their substance. After they have existed for an indefinite period, they generally lose their grayish, opaline tint, and assume the appearance of common tubercles. The change usually begins in the centre, in the form of an opaque, yellowish point, which progressively increases until the whole body is completely softened, or converted into a curdy, friable substance, not unlike semi-concrete cheese.

The gray granulation is most commonly met with in the lungs, and on the free surfaces of the serous membranes, both natural and adventitious. It also occurs, and that with considerable frequency, in the mucous follicles of the alimentary canal, in the glands of Peyer, in the larynx and trachea, in the spleen, liver, kidney, and brain. Its existence has been attested in the bones, and in the lymphatic ganglions. It occasionally forms with great rapidity, especially in the brain and arachnoid membrane, where the resultant irritation may prove fatal in a few weeks. In the peritoneum, hundreds may be developed in a few days, from the volume of the smallest pin-head to that of a millet-seed. They may occur alone, or, as is almost always the case, be associated with the yellow miliary tubercle. So constant, in fact, is this coexistence that it may be assumed as a law liable to few exceptions. In 358 subjects, Louis met with only five examples of granulations without yellow tubercles, and two of tubercles without granulations.

Considerable discussion has been occasioned respecting the true character of these gray granulations, or, as they are termed, after the pathologist who first described them, "Bayle's granulation." Some have denied their tubercular nature altogether; others, Laennec included, regard them as nascent tubercles; to me they appear merely as a variety of the ordinary gray tubercle, an opinion which I have long taught in my lectures.

The gray granulation seems to be modified by the action of the affected part, the state of the blood, and the condition of the general health. If serum, lymph, and pus are modified in this manner, as we know they are, why should tubercle not be? That they are liable to assume the characters of the common yellow tubercle is certain, but death may, and often does, take place before any such change is effected. The gray granulation may precede the yellow tubercle, or it may be deposited simultaneously with it. Under whatever circumstances it is found, it is endowed with much greater power of resisting the influence of such agents as have a tendency to destroy it. It is evidently the product of a more healthy action; it indicates a better state of the solids and fluids; in a word, it is a more plastic, organizable substance than common tubercle.

*How formed.*—When first effused, tubercular matter is perfectly soft, fluid, or semiliquid. By degrees, however, as its more attenuated particles are removed, as they always promptly are by the absorbent vessels of the surrounding tissues, it becomes dryer, denser, more opaque, and more solid, and may ultimately acquire the consistence of fibro-cartilage. This constitutes the second stage of the disease, or that of crude tubercle. The period required for this change has not been ascertained. The probability is that it is short. In acute phthisis the tubercles may reach their full development in three or four weeks; while, in the peritoneum, there is reason to believe that they often attain this stage much sooner.

In some parts of the body, as, for example, in the peritoneum, we can detect nature, as it were, in the very act of her work, being able to trace this substance distinctly as it passes from the fluid to the solid state. In chronic inflammation of this membrane, I have repeatedly seen tubercles in every possible stage of development; some, evidently deposited only a day or two before the individual expired, being soft, viscid, and perfectly transparent; others semi-concrete, yellowish, and consequently more or less opaque; and, lastly, another set perfectly dense and firm, organized, and covered by an accidental serous membrane, of the most delicate texture. Thus, the conclusion is obvious, that all tubercular matter, whatever be its form, site, or extent, is, in the first instance, of a liquid nature, and that it becomes solid, concrete, or crude only by the removal of the serosity which is always poured out along with it.

It has been a subject of speculation how a tubercle, originally not larger than a pin's head, may increase to the size of a pea, a cherry, or even an almond. The most plausible hypothesis ascribes the enlargement to juxtaposition, or to the superaddition of one particle to another. The cause which provoked the original deposit continuing in operation, leads to irritation in the surrounding parts, in consequence of which new molecules are effused around those already formed, and which thus serve as their nuclei. The process is thus not unlike that of amorphous crystallization. It is upon this circumstance that many pathologists have founded an argument against the vitality of tubercle, forgetting that lymph, the basis of all new growths, is deposited precisely in the same manner.

All tubercular matter, whatever be its site, form, or consistence, is a direct product of the blood, elaborated by a process of secretion similar to that which presides over the separation of serum, lymph, and pus. The effusion is always effected under the influence of inflammatory irritation, and is preceded, in almost all cases, by the tubercular dyscrasia or cachexy. All the solids are enfeebled, and the blood itself is singularly changed in its properties. Even at a comparatively early period it is already quite thin, impoverished, and deficient in globules; its color resembles that of pale claret; and the clot is unusually small and dense. Thus a predisposition is established, which may be excited into action by a thousand extraneous circumstances, and without which there would rarely, if ever, be any deposit of this kind.

In the former editions of this work I expressed the opinion that tubercles are always of inflammatory origin, specific in its character, and a more thorough examination of the subject since has only tended to confirm this conclusion. The concomitant action is usually very languid, or so mild and imperceptible that extensive mischief is often done before the patient is aware of it. In this respect, the development of tubercles resembles that of a strumous abscess, which is rarely characterized by any of the ordinary phenomena of phlegmasia.

The doctrine of the inflammatory origin of this disease is countenanced, if not actually established, by the following circumstances:—

First, by chemical analysis. Experiments show them to afford albumen, gelatin, and fibrin; substances which, whether they occur alone, or in combination with each other, are always to be regarded, when found upon the surfaces or in the interstices of the organs, as the result of inflammatory irritation.

Secondly, tubercular matter bears a very great resemblance to spoiled, degraded, or cacoplastic lymph, which is an acknowledged product of inflammation.

Thirdly, the deposit is often excited by cold, especially when conjoined with moisture, and by unwholesome, indigestible, or innutritious food. Dyspepsia frequently leads to the same result. By the former are produced internal congestions; by the latter, a poor and impoverished state of the blood, so favorable to the development of tubercle.

Fourthly, in many cases the disease is attended or preceded by hyperæmia, or active congestion. This often happens in the lungs, the pleura, peritoneum, and lymphatic ganglions.

Fifthly, the doctrine of the inflammatory origin of this deposition derives great plausibility from what occurs in the inferior animals, from mechanical irritation. In the experiments of Cruveilhier, Kay, and Saunders, well-characterized tubercles were produced in a very short time, simply by dropping mercury into the trachea. Similar effects are frequently witnessed in miners, needle-grinders, and weavers, who habitually inhale gritty or irritating matter. Persons of this description are peculiarly prone to phthisis.

Sixthly, there is no appreciable deposit, or effusion in any of the shut sacs, cells or cavities of the body, which is not, strictly speaking, the result of inflammatory action, though this may be too slight to attract attention, or to be attended by the ordinary phenomena of that process.

*May become organized.*—Are tubercles ever organized? Concerning this question, which has been greatly agitated within the last twenty years, much diversity of sentiment still prevails among pathological anatomists. While many deny that these little bodies are susceptible of this process, on the ground that they are mere morbid secretions, and consequently essentially non-vascular bodies, others maintain that they are supplied with vessels, and endowed, like hydatids, serous cysts, and adventitious textures generally, with an independent vitality.

Laennec, it is well known, maintained the independent vitality of tubercle, but failed to adduce any evidence of its organization. Lugol positively asserts that he has, in numerous instances, detected blood-vessels in this deposit. In a valuable paper, in the twentieth volume of the *Medico-Chirurgical Transactions* of London, Dr. P. N. Kingston gives an account of seven cases, in which great numbers of pulmonary tubercles, of the ordinary kind, presented, under the microscope, red vessels, which extended into their interior, and anastomosed, not only with each other, but with the vessels of the adjacent tissues. In one of the cases red vessels were seen in the deposit in the bronchial and mesenteric ganglions. Professor Macartney and Dr. Carmichael, of Dublin, also maintain the independent vitality of tubercle. The former states that he has demonstrated the presence of vessels by injection. In a lung which Dr. Bayless injected, at my request, ten years ago, with size colored with vermilion, a number of tubercles exhibited the clearest possible evidence of vascularity. On cutting into a mass of this kind, a tubercle, about the size of a duck-shot, and of a light grayish color, was divided, from the centre of which the artificial fluid, which was still warm, ran in a small jet or stream, precisely as blood flows from a divided vessel. Louis,[1] although he does not believe in the organization of this substance, on one occasion observed vessels in it. He injected the pulmonary artery, and found ramifications of it in some of the gray semi-transparent masses.

---

[1] Pathological Researches on Phthisis, case 29th, p. 331.

Another proof, but of a more indirect character, of the organization of tubercle, is furnished by the fact that these bodies are often of a yellowish tint in jaundice. This is obviously owing to the admixture of the coloring principle of the bile with the blood, both of which are simultaneously circulated through the heteroclite mass.

Again, it may be presumed that tubercles are organized from the transformations they undergo. The process of softening which generally begins in their centre, beyond the influence of external agents, admits of explanation in no other way.

Finally, tubercles, as will presently be seen, are occasionally converted into cretaceous, sandy, or earthy concretions; which could hardly happen if they were not organized products. In this transformation, which may begin at any part of their interior, the animal matter is gradually absorbed, and its place occupied by chalky matter, or phosphate and carbonate of lime.

I have never been able to trace any nerves or absorbents into these bodies, nor am I aware that this has been done by others; nevertheless, as these structures are everywhere necessary to organization, it is perfectly philosophical to infer their existence.

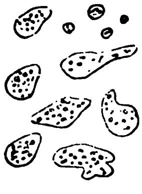
That tubercles are invariably organized, or provided with vessels, nerves, and absorbents, no one acquainted with the subject will assert. There are some situations, indeed, in which it would be impossible for the process to be established; as, for example, when the strumous matter is spread over the free surface of the mucous membranes, whether in the bronchial tubes, the uterus, seminal vesicles, or the excretory ducts of the kidneys. Here the heterogeneous nature of the contents of these reservoirs alone would be an insurmountable barrier to the organization, to say nothing of the peculiar modified character of the morbid secretion itself. I say *peculiar modified character*, because it is well known that the chemical and physical properties of tubercular deposits are widely different in the localities here specified from what they are in other parts of the body. They usually have a deeper yellowish color, are much more curdy and friable, and contain a much greater amount of earthy ingredients. Upon this point it is hardly conceivable that there should be two opinions.

Thus, then, it may be stated, as a general proposition, that, when the tubercular matter is deposited upon the larger mucous surfaces, it is not susceptible of organization; whilst, when it is effused into the cavities of the cellular tissue, into the air-vesicles of the lungs, and into the intermolecular spaces of our organs, it may, and often does, become "part and parcel" of the living frame. Within the last fifteen years I have examined not less than ten or a dozen specimens of organized tubercles of the kidney, spleen, peritoneum, and lungs, mostly of young subjects. The tubercles were of the miliary kind, and numerous vessels, loaded with florid blood, could be seen shooting into them in every direction, many of them penetrating a considerable distance into their substance. Their vascular supply would thus seem to be derived from the tissues in which they are deposited; and this, in the generality of cases, is no doubt true; nevertheless, there is reason to believe that they occasionally possess a self-organizing power, analogous to that of the adventitious membranes of the splanchnic cavities. If, under favorable circumstances, plastic lymph is capable of generating its own vessels, why should not tubercle be? Although the vessels thus formed must be very small and few in number, they are probably sufficient, in many instances, to preserve the vitality of the tubercle without the aid of the circumjacent textures. Generally, however, such aid is not long withheld; for, as the newly-created vessels extend from the central to the peripheral portion of the heterologous deposit, they speedily communicate with the arteries and veins of the affected organ. It is in this manner that the organization of tubercle may be supposed to be accomplished, and in proportion to its perfection will be its power of resisting destruction.

In making these remarks, I do not wish to be understood as asserting that I have seen the vessels which are here supposed to form the proper circulation of tubercle; their existence is altogether assumed from the analogy afforded by encephaloid growths, and the adventitious membranes. Actual observation will, perhaps, never avail us much in determining the question, since the subject is beset with difficulties scarcely to be found in any other morbid deposit. But I do assert, unhesitatingly, that I have repeatedly traced vessels into such tumors from the tissues around them, and that, upon dividing them, the section thus made has frequently exhibited small florid dots of blood. But it may be objected that these vessels have never been injected. Granting this to be true, and what, it may be asked, does it prove? Are we reduced to the necessity of denying the vitality of a structure, because we cannot succeed in throwing foreign substances into its vessels?

*Microscopical Characters.*—Of late years the microscopical character of tubercular matter has been studied with great care. It consists of granules, nuclei and cells lying in a transparent matrix. Most of the granules are very minute, and afford an albuminous reaction; some are fatty, and dissolved by ether. In the yellow variety of tubercle fatty granules generally abound. The free nuclei, or *tubercle-corpuscles*, constitute a large portion of each tubercular mass. In shape they are very irregular, some being round, others oval, oblong, or almost shapeless. They inclose fine, granular contents, but commonly no nuclei. Their size varies from 1-3500th to 1-2500th of an inch in diameter, and they are regarded by Lebert and his school as the characteristic corpuscles of tubercle. Large cells with several nuclei are occasionally found in tubercular masses, especially in the air-vesicles of the lung, adhering to the walls, or in their interior. These cells, or the "compound corpuscles of tubercle," were first described by Virchow in 1851. Their exact nature is not determined; by many they are considered as abnormal epithelial cells.

Fig. 38.



Tubercle-corpuscles.—After Da-Costa.

Besides these elements, we may find in tubercular masses, oil drops, crystals of cholesterine, and large irregularly-shaped flaky bodies, probably of an albuminous nature, elastic fibres, and epithelial cells, in various stages of fatty degeneration. To morbid changes in the epithelium, several distinguished pathologists have, indeed, attributed the formation of the tubercular corpuscles and deposits.

*Changes.*—When tubercular matter has arrived at the crude stage, it may remain stationary for an indeterminate period. The circumstances which favor its preservation are dependent partly upon its own intrinsic powers, and partly upon the condition of the surrounding tissues. The state of the general health, also, no doubt, exerts an important influence. When tubercles exist in excess they may, so to speak, produce their own destruction, by the pressure which they exert upon each other, and upon the parts in which they are developed. In what is called "galloping" consumption, the period of latency may not exceed five or six weeks. In the ordinary form of the disease, however, the interval is much longer, and may extend to several years.

The changes which a crude tubercle may undergo are three: softening, absorption, and the chalky or cretaceous transformation. Of these the first is incomparably the most frequent, and is always accompanied by more or less destruction of the surrounding tissues.

*Softening* constitutes the third stage of tubercle. By some this change of consistence is supposed always to begin at the centre of the morbid mass; while others, on the contrary, maintain that it may commence at any part, indifferently, at the centre or at the circumference. Careful examination leads me to conclude that the process may take place in the latter way, but, in the great majority of cases, it unquestionably begins in the interior of the morbid deposit. In fact, so common is this that it may be regarded as the law, the other as the exception. The softening sometimes occurs simultaneously at several points, and is then usually very rapid. As it advances, the tubercular substance presents a moist, macerated, and unctuous character, and is gradually transformed into true scrofulous pus. When the degeneration involves the entire mass, it is usual to find two different kinds of matter in the little abscess which now occupies its place. Of these one is thick, straw-colored, and inodorous, like laudable pus; the other thin, whey-like, and mixed with small, opaque, cheesy flakes.

Agreeably to the doctrine which it has been my endeavor throughout this chapter to enforce, that tubercles are organized structures, the softening of these bodies may be supposed to be analogous to slow suppuration, by which they are gradually broken down and dissolved. They contain, in fact, within themselves the germs of their destruction; they possess only a low grade of vitality; their power of resistance is comparatively feeble; and hence they readily yield to whatever has a tendency to disturb their molecular arrangement. After they have existed for an indefinite period, they create more or less irritation in the textures immediately around them. This irritation is speedily propagated to the tubercles themselves, which, as they have little plastic force, soon yield to the invasion, the rapidity of their softening being always in direct proportion to the intensity of the exciting cause, and the density of the morbid mass.

Those, on the other hand, who believe that tubercles are inorganizable products, maintain that their softening is effected solely by the agency of the surrounding tissues. According to this theory, they produce, like any other extraneous bodies, an irritation—an afflux of blood—followed by a secretion of purulent matter; which, insinuating itself into the heterologous deposit, thus causes its disintegration. This theory, however, is opposed by the fact, previously adverted to, that the softening generally begins at the centre of the morbid product, where the surrounding tissues can exert no influence.

The softening takes place much more rapidly in some organs than in others, in which it does either not occur at all, or only after a long period. In the lungs, where the process has hitherto been chiefly studied, it may take place as early as the end of the first month from the time of the deposition, though generally not until much later. Upon this subject, however, it is obviously impossible to lay down any definite rule, as the production of the phenomenon in question must necessarily be influenced by a great variety of causes, such, particularly, as the extent of the disease, the state of the patient's health, and the density of the heterologous deposit. Occasionally the softening goes on simultaneously over a large extent of surface, so as to break down one-third, a half, or two-thirds of an organ; but this is rare, and is confined exclusively to acute cases. In the lungs, the degeneration usually begins at the summit, and gradually extends towards the base, as is shown by the fact that if these viscera be examined in this direction, we successively find, at various heights, excavations and tubercles in different stages of softening, the more solid being almost always lowest in the scale. Before the changes, of which we have now spoken, take place, the morbid deposit appears to create little disturbance in the general economy, and may exist, sometimes to a very considerable extent, without giving rise to symptoms indicative of its presence.

After having become perfectly soft, the tubercular matter is either absorbed, or, if it be favorably situated, it works its way out. In the lungs, it usually breaks into the bronchial tubes, leaving thus, not unfrequently, a considerable number of *excavations*, *cavities*, or *fistulous apertures*. In these organs the caverns are rarely entirely empty before the end of the third or the beginning of the fourth month, counting from the time of the invasion of the disease. In recent cases, the walls of the chamber are soft, and lined by a thin layer of lymph; in the more ancient ones, the false membrane is dense, grayish, and from one-fourth to one-third of a line thick.

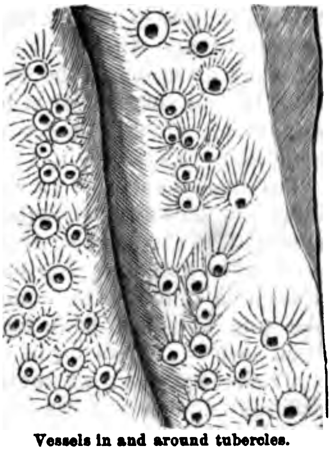
These excavations are most common in the lungs: they are sometimes found in the brain, liver, spleen, kidney, and bones; but so seldom that our knowledge concerning them here is still very imperfect. In the kidney I have met with them repeatedly. In the long bones they occasionally communicate with the medullary canal, or some contiguous joint, establishing thus an analogy with tubercles of the lungs opening into the bronchial tubes; in the short bones, as those of the spine, it is not uncommon for them to make their way to the surface by long, tortuous passages, which it is always difficult, and frequently impossible to heal.

The size of these caverns is variable. We frequently find them as large as a hen's egg, and, in some instances, even of the volume of the fist: generally, however, they are much smaller, not exceeding the dimensions of a hazel-nut, an almond, or a walnut. The lesions which are observed in the tissues around these cavities, and the changes experienced by the vessels, will be more fully described in the chapter on tubercles of the lungs, to which I must also refer for an account of the process of cicatrization, as it takes place much oftener in those organs than in any other parts of the body.

It is very probable that crude tubercles, after a certain period, may be absorbed, and disappear. This conjecture, at all events, is countenanced by what is occasionally witnessed in the human subject, in which, after the symptoms of pulmonary phthisis are apparently well developed, they gradually vanish, and the patient regains his accustomed health. In scrofulous affections of the lymphatic ganglions of the neck and mesentery, especially of young children, there is every reason to believe that the tubercular matter is often removed in this manner. In the bones, too, the probability is that it is not always followed by softening.

Finally, tubercles may undergo the cretaceous, sandy, or *calcareous degeneration*. This increase of consistence is most liable to occur in those cases wherein these bodies contain a great disproportion of curdy, friable substance, and in which they have established a sort of tolerance in the surrounding tissues. The transformation, although noticed in various situations, is most frequent in the summits of the lungs and in the bronchial lymphatic ganglions. The animal matter of which crude tubercles naturally consist appears to be abstracted, and its place supplied by the earthy salts, especially the phosphate and carbonate of lime, which have been shown by Thenard, Lombard, and L'Heritier, to form from ninety-three to ninety-eight per cent. of the entire mass. Thus it would seem that in cretaceous and common tubercle the proportions of the ingredients are merely reversed. Advanced age greatly favors this transformation, which, however, sometimes occurs in very young subjects and even in children.

Fig. 39.



Vessels in and around tubercles.

When the tubercles are very numerous, or unusually voluminous, they must necessarily exert injurious pressure upon the parts in their immediate vicinity, and thus embarrass, if not entirely interrupt, their functions. The proper tissues of the organs are more or less strangulated, and many of the vascular ramifications are obliterated by absorption or adhesive inflammation. Even the larger trunks are sometimes very much encroached upon by these bodies. It is in consequence of this obstruction that a sort of supplemental circulation is sometimes established, the object of which is to compensate for the otherwise insufficient nourishment of the affected tissues. The new vessels are arranged in arborescent lines, or in the form of a delicate and beautiful network around the tubercular deposits, to the development and vitality of which they no doubt materially contribute. They are often very numerous, and may be readily filled with fine injection. Fig. 39, from Lobstein, is an excellent illustration of these vessels from a case of granulations of the peritoneum.

---

## SECTION II.

### MELANOSIS.

One of the most singular, and, at the same time, one of the rarest of the heterologous formations, is the melanotic, for a correct knowledge of which we are indebted to Laennec. The first account of this disease was given by this distinguished pathologist in 1806, in the Bulletins de la Faculté de Médecine de Paris. The term employed to designate this morbid product is a Greek compound, literally signifying black disease, and is synonymous with what has since been called black cancer.

The account which Laennec has left of this accidental product, and which may be considered as one of the most accurate and graphic that has ever been furnished, describes it as a homogeneous substance, very similar in its structure and consistence to a bronchial gland, of a deep black color, opaque, humid, and slightly unctuous to the touch. This substance, after a while, has a tendency to become soft; the process by which this is effected generally commencing in the centre, and gradually proceeding towards the circumference, until it is entirely broken up and dissolved. When this is accomplished, nature sets up an eliminating effort, the surrounding parts take on inflammation, and the heterologous matter is finally expelled, thus leaving a corresponding cavity, which either continues open, is lined with lymph, or else completely obliterated.

No *age* seems to be exempt from this disease, though it is, without doubt, much more frequent in the old than in the young. Nor is it confined exclusively to the human subject. It has been frequently seen in the horse, ox, dog, cat, rabbit, rat, and mouse. What is remarkable, it is much more common in white than in colored horses; and the same is true, I have reason to believe, in regard to cattle. It has been seen in certain birds, as the heron.

The *composition* of melanotic substance has been examined by different chemists, both in England and on the continent of Europe; but the most complete investigation which has been made, is that of

Dr. Barruel, of Paris. According to this chemist, melanosis of the human subject is essentially composed of the coloring matter of the blood, united with fibrin, and of three distinct fatty substances. Of these, the first is soluble in alcohol at a moderate heat, and susceptible of crystallizing in small brilliant scales; the second is soluble only in boiling alcohol, soft, and amorphous; the third is fluid at the ordinary temperature of the atmosphere, of a reddish-brown color, and contains a considerable quantity of phosphate of lime and iron. The result of this analysis is fully confirmed by that subsequently obtained by Dr. Hecht,[1] from a specimen of melanosis of the lungs.

Dr. Henry, of Manchester, found that a stream of chlorine, passed through a solution of this substance, destroys its black color, and throws down light yellowish flakes. Boiling produces no change, not even when a small quantity of caustic potash is added. Acids do not alter it, except the nitric, which turns it yellow. Corrosive sublimate, the nitrate of mercury, and the muriate of tin precipitate it, the supernatant fluid being left quite clear.

To these analyses it may not be improper to add the results obtained by Dr. Foy, of Paris, from a melanotic tumor of the horse. They are as follows:—

| | |
|---|---|
| Albumen | 15.00 |
| Fibrin | 6.25 |
| A highly carbonized principle, probably altered cruor | 31.40 |
| Water | 18.75 |
| Oxide of iron | 1.75 |
| Sub-phosphate of lime | 8.75 |
| Muriate of potash | 5.00 |
| " soda | 3.75 |
| Carbonate of soda | 2.50 |
| " lime | 3.75 |
| " magnesia | 1.75 |
| Tartrate of soda | 1.75 |
| | 100.40 |

The pure substance of melanotic tumors freed from the other organic substances which generally accompany it, has had the name of "melanine" given to it, and is identical in chemical composition with the pigmentary substance of the choroid coat and iris. It is insoluble in water, alcohol, diluted acids, and only sparingly soluble in alkalies, unless very concentrated. It is opaque, and without any marked taste or smell, and is composed of carbon, hydrogen, nitrogen, and iron, in almost similar proportion as found in hematin, excepting that it contains less iron. When placed in contact with white linen, it readily communicates to it its peculiar tint; but the stain that is thus produced is easily removed by ablution. Exposed to the atmosphere, it becomes dry, brittle, and pulverizable, and a long period elapses before it undergoes decomposition. By burning, it is converted into a dark, carbonaceous substance, and emits a strong empyreumatic odor.

The *color* of melanosis is considerably influenced by accidental circumstances, as the quantity of cruor and cellular tissue entering into its composition. It may be said always to incline to black; but not unfrequently it presents various shades of brown and yellow, which are usually most conspicuous when this substance is stirred in a small quantity of water. In its consistence, melanosis varies from the fluidity of ink to the density of fibro-cartilage.

---

[1] Lobstein, Traité d'Anat. Patholog., t. i. p. 463.

The *minute texture* of melanosis has been carefully investigated by Müller,[1] who finds it to consist of a fibrous network, and of numerous meshes, occupied by free, unadherent pigment cells, the largest of which are more than 0.00108 of an English inch in diameter; the smaller vary from 0.00105 to 0.00039, or even less. They are of a pale yellow color, dark, or dark-brown, and of a rounded, oval, or irregular figure; some are elongated, and a few are actually caudate, terminating at one or both extremities in a point, or in a fibril. The pigment cells are not present in all specimens, and the smaller ones are supposed to be young cells set free by the rupture of the old. They are filled with yellowish or blackish granules, and a few of the larger ones occasionally contain, independently of these bodies, a nucleus with its nucleolus. In some of his examinations, Müller found the granules free, and dispersed through the meshes of the fibrous network. It is probable that, in these instances, the cells were dissolved, or broken down, so as to allow their contents to escape.

These colored granules may be found in the cells of other structures, both normal and abnormal. They are seen in the lung-pigment and frequently in elements of cancerous tumors. Their occurrence in this latter class of growths has made several pathologists doubt the existence of melanosis as a separate disease, and especially as distinct from cancer; but such is not the view that I believe the most correct. How these pigment-cells of melanosis are formed is matter of doubt. Virchow considers them as transformations of blood-corpuscles within cell-walls.

*Varieties of Form.*—With respect to form, there are six varieties under which this matter is deposited, the tuberoid, lamellated, dot-like, infiltrated, ramiform, and liquid.

The *tuberoid* variety, as the name indicates, occurs in distinct masses, varying in diameter between a currant and a walnut, of a dull sooty color, and of a spherical, ovoidal, or conical shape. By the agglomeration of a number of such bodies, large tumors are sometimes formed, with a rough, lobulated surface, which always attain their greatest development in the cellular and adipose tissues. In the human subject, their size seldom exceeds that of the fist; in the horse, on the contrary, they have been found to weigh from twenty to forty pounds.

A thin, transparent covering, evidently formed out of the natural tissues, invests these tumors, and gives them the appearance of being encysted. Vessels and nerves are occasionally seen ramifying over their surface, or penetrating their substance, and in many cases they are intersected by fibrous filaments, which are either derived from the general envelop, or they are the remains of the lacerated cellular substance into which the heterologous matter is originally deposited. These circumstances have led to the opinion—at first sight plausible enough, yet wholly erroneous—that the black matter of these tumors is organized. Of the vessels which are distributed to the melanotic mass, the veins greatly predominate; they are often very large and tortuous, and are liable to give way under the most trifling causes. Both arteries and veins are incapable of being injected, the matter used for this purpose being always extravasated in the substance of the morbid deposit.

---

[1] Op. cit., p. 56.

When the tumor is developed on the serous surfaces, it frequently presents a pedunculated appearance, like certain polypes of the uterus, and vagina. In such cases it is always surrounded by a distinct cyst, of which it is difficult to say whether it is a new formation, or simply an extension of the natural membrane. There is another variety of melanotic tumor in which the covering seems to be formed by condensed fibrin, effused, in all probability, as a consequence of the irritation excited by the presence of the foreign matter. Sometimes the cyst is of considerable thickness, firmly connected with the circumjacent tissues, and furnished with minute vessels; generally, however, it is remarkably thin, soft, flocculent, and without the least visible trace of organization. This variety of melanosis occurs most commonly in the liver and brain. It is extremely rare in the human subject, but I have noticed it repeatedly in the liver of the ox.

The *lamellated* variety is observed chiefly in the inferior animals; it is extremely rare in the human subject. It is confined exclusively to the serous membranes, where it is usually deposited into the connecting cellular tissue, in small, irregular patches, of a black brownish color. More rarely the matter is poured out upon the free surface of these textures. When this happens, the layer is seldom more than the fourth of a line in thickness, of a soft, pulpy consistence, and covered with a thin, transparent pellicle of new formation. The peritoneum is the most common seat of the lamellated variety of melanosis; and here it is often difficult to distinguish it from the spurious form of the disease, caused by the deposition of blood, and the subsequent changes which this fluid undergoes from contact with the acid contents of the alimentary tube. In some instances the serous membranes present a stained appearance, as if the heterologous matter had been effused into their intermolecular spaces. Such spots are not infrequent in the peritoneum of those who die of ascites.

In the *punctiform variety* the melanotic matter appears in small points, thousands of which are sometimes scattered over the surface of the affected organ, giving it a singularly speckled aspect. This form of the disease, which may be easily imitated by dusting a piece of white paper with soot or powdered charcoal, is most common in the lungs, liver, and subserous cellular tissue of the alimentary tube. I have also repeatedly seen it in the skin of white horses. When the points are very close, the affected part may present the appearance of being *infiltrated*. *Ramiform* is the term used when the adventitious matter is contained in the vessels deposited upon their surface, or effused among their tunics. This variety is chiefly met with in the liver and the lymphatic ganglions, either alone, or in association with the infiltrated and tuberoid forms.

Finally, melanotic matter may present itself in a *fluid state.* This form, however, is exceedingly rare, and is noticed chiefly in the serous cavities, the lungs, and the urinary organs. A considerable number of examples of collections of liquid in the peritoneal cavity, of the color and consistence of ink, are on record. It must be confessed, however, that it admits of much doubt whether the effused matter was usually anything more than blood, altered in its composition by the agency of the absorbent vessels. Instances in which melanotic fluid was expectorated, though rare, are mentioned by different writers; and examples are on record in which it was voided along with the urine. Black, inky-looking matter has often been discharged by vomiting and stool. A case has been published in which a cyst, developed in one of the kidneys, contained eight ounces of this liquid.

The *tissues* most prone to the melanotic deposition are, beyond all comparison, the cellular and adipose. Large masses of this substance are often met with under the skin, particularly of the trunk, in the mediastinal cavities, in the folds of the mesentery and omentum, and around the kidneys. In horses, the subcutaneous substance of the buttock, anus, vulva, and tail, is a very common seat of the disease. Of the different organs, the liver, lungs, spleen, eye, kidneys, and ovaries, may be enumerated as being most frequently affected. The lymphatic ganglions, especially those of the bronchiæ, are also very liable to it. The bones, fibrous and serous membranes, the pancreas, arteries, and salivary glands, are seldom implicated; while the brain and spinal cord, the nerves, the veins, the muscles and their tendons, the cartilages, the synovial and mucous membranes, the uterus and mammary glands, the thyroid and thymus bodies, the prostate, testicle, seminal vesicle, and supra-renal capsule, enjoy almost an entire immunity from its invasion. I have seen melanosis of the heart; but this is the only portion of the system of involuntary muscles in which this disease has been found.

The system is not unfrequently affected with a genuine *melanotic diathesis*, the disease in question occurring either simultaneously, or in tolerably rapid succession, in a great number of organs and tissues. Of this a remarkable example came under my observation in 1855, in a man, aged fifty-eight, a pilot on the Ohio and Mississippi rivers. He had been an invalid for upwards of twelve months, during eight of which he had been constantly confined to his bed. His principal symptoms were, progressive emaciation, a frequent, irritable pulse, night-sweats, harassing cough, occasional discharges of blood from the bowels, and a frequent desire to void his urine. Towards the last, œdema of the extremities supervened, aphthæ formed in the mouth, and he finally died completely exhausted.

An examination of the body, made by Prof. T. G. Richardson and myself, disclosed the existence of numerous tubercles in the subcutaneous cellular substance, chiefly on the abdomen, chest, and shoulders, of a black or grayish color, movable, firm, of a rounded or ovoidal shape, and from the size of a small pea to that of the kernel of a prune. A few of the larger tubercles projected into the skin, imparting to it their peculiar tint. The lymphatic ganglions of the groins and axillæ were enlarged and melanotic. The omentum and peritoneum presented thousands of black shot-like tubercles, interspersed, here and there, with whitish ones, very vascular, and of larger volume. The spleen was sound; but the liver and gall-bladder, the pancreas, stomach, small and large bowel, the kidneys and supra-renal capsules, the urinary bladder, prostate gland, and seminal vesicles, the lungs and pleuræ, the bronchial ganglions, the thyroid gland, and the heart, were all more or less extensively involved in the melanotic disease. No examination was made of the brain, voluntary muscles, and bones, except the sternum, which was natural. The vessels were free from the characteristic deposit.

One of the most remarkable features in the above case was the existence of numerous white and grayish tubercles in the midst of the black, indicating that the former were of younger growth, and that they had not yet been impregnated with the melanotic matter; or, what is the same thing, that the older the tubercles were the darker was their color.

Melanosis may exist alone, or be combined with other heterologous formations. Of these the most common is the scirrhous; the rarest, the tubercular. The tissues immediately around the melanotic deposit are often very much contaminated. Sometimes they are only hardened, or perhaps softened; at other times they are extensively infiltrated with the morbid matter, and of a deep black color. When the tumors are developed in the muscular substance, the fibres are merely pushed aside by them, without being contaminated by the disease. The nerves and bones likewise remain intact.

Melanotic tumors, after having acquired a certain size, generally *remain stationary*, giving rise to little or no inconvenience, save what results from their bulk and consequent pressure. At times, however, they manifest a disposition to ulcerate, and, when this happens, an intractable sore is left, with hard, ragged edges, from the surface of which there is a constant discharge of black, inky matter, mixed with blood, pus, or a thin, fetid, ichorous fluid. When removed, the most remarkable feature of these tumors is their tendency to reappear in the neighborhood of the cicatrice, or in some other situation.

The melanotic matter is always deposited in the liquid form. Indeed, we can scarcely conceive of the possibility of its being secreted in any other way. In the course, however, of a short time after the effusion has taken place, the matter becomes inspissated, by the gradual absorption of its more attenuated particles; and in this manner it finally acquires the hardness and density of a solid substance. What corroborates this view, is the fact that thin, liquid melanotic matter is sometimes found in the splanchnic cavities without any breach of the serous membranes, and that it frequently exudes in this form from the surface of carcinomatous and other tumors, in a state of ulceration.

Of the *causes* of this disease, and of the states of the system which predispose to it, nothing is known with any degree of certainty. That the melanotic matter is derived immediately from the blood, both anatomical examination and chemical analysis abundantly show; but how far, or in what respect, this fluid is altered before the deposition is effected, are points in the history of this disease concerning which pathology and physiology are equally silent and undetermined. If we remember that melanosis is essentially composed of the same elements as the coloring matter of the skin and of the choroid coat of the eye, we may be allowed to suppose that this substance, existing in an unnatural quantity in the blood, is deposited by an aberration of the nutritive functions of the vessels, into organs and tissues in which it is not found in the normal state. By some, however, melanotic matter is regarded as effused blood, which has undergone a peculiar pigmental transformation. It is said to be most common in individuals of a melancholic temperament. In the inferior animals, especially in horses and asses, it often betrays an hereditary tendency, and the same circumstance has occasionally been witnessed in the human subject.

Melanosis, even when in a state of suppuration, does not seem to be communicable by immediate contact. Gollety-Latournelle repeatedly attempted to propagate the disease from infected mares to healthy horses during coition, but without success. Gohier inoculated horses, asses, and dogs with matter of this kind, without, in a single instance, inducing the disorder.

## SECTION III.

### SCIRRHUS.

SCIRRHUS may be defined to be a hard, crisp, opaque substance, of a light grayish color, with dull yellowish, fibrous intersections, organized, liable to lancinating pain, occurring for the most part after the middle period of life, and passing sooner or later into ulceration. The disease, like tubercle, has its regular period of growth, maturation, and decay; like it, it is merely a local manifestation of a constitutional disorder; and, like it, its tendency is ultimately to destroy, not only the tissues in which it is deposited, but also the life of the individual. To comprehend, in the fullest manner, the circumstances which modify its physical characters, the disease should be studied in its various stages and in different organs of the body.

*Varieties of Form.*—Scirrhus occurs as a solitary tumor, or in disseminated masses, as an infiltration, or as a lamella, of variable extent and thickness. Of these varieties the first is by far the most common; both the others, especially the second, are infrequent.

In the *tuberoid* variety, the heterologous substance forms small circumscribed nodules, the number of which, as in the liver, is sometimes very great, and the consistence of which varies between fresh pork and fibro-cartilage. Their size and shape are much influenced by the nature of the tissues in which they are developed, and by the resistance which is offered to their progress. Single tumors of this kind are rounded, ovoidal, or conical; when, on the contrary, several are agglomerated together, they are generally very irregular, angular, and more or less lobulated. In their size they vary between a mustard-seed and an adult fist, their average being that of an almond, a lemon, or an orange.

In the *infiltrated* form, the morbid matter is diffused through the interstices of the affected organ, which it converts into a substance similar to itself. It is extremely infrequent, and occurs chiefly in the lungs, liver, uterus, kidneys, and bones. The primitive texture, whatever it may be, gradually loses its normal color and consistence, but its volume is seldom much augmented or diminished.

Finally, the adventitious matter may appear in the form of a *lamella*, layer, or stratum, either beneath or upon the surface of the serous and mucous membranes. This variety is most frequently met with in the submucous cellular tissue of the œsophagus, stomach, and bowels. In these situations it is not unusual to find large patches of this description, of a pale bluish tint, crisp, from one to six lines in thickness, and of a dense, fibro-cartilaginous consistence. The lining membrane, together with the muscular tunic, sooner or later participates in the disease; and the part of the tube corresponding with the seat of the lesion becomes hard, rigid, and contracted.

*Structure.*—A scirrhous tumor creaks under the knife, is opaque, firm, inelastic, and of a white bluish color, with various shades of gray, rose, and drab. These tints are most conspicuous when there is an admixture of bile, blood, or pus, as sometimes happens when the heterologous matter is very old. Thin slices of it are found to be semi-transparent, flexible, and elastic; when dried, they exhibit nearly all the properties of the horny tissue. Fibrous intersections, generally of a slightly yellowish color, are seen to pervade the diseased mass, starting from the centre as their common nucleus, and radiating thence towards the circumference. These lines are merely the remains, in most cases, of the cellular substance of the affected part, and are often so arranged as to resemble very closely the fibrous structure of an unripe pear or turnip. A creamy-looking fluid is occasionally incorporated with the heteroclite mass, and constitutes the most decided evidence of its carcinomatous nature.

Scirrhous growths, especially such as occur in the female breast, occasionally contain hydatids. A more common appearance is the development of cysts, filled with a thin, grayish, gummy substance. Clotted blood is likewise present in some instances. By some writers, scirrhous tumors are said to be always furnished with a distinct cyst; as a general rule, however, this is not the case, and this forms one of their characteristic features. When they are very large and old, the cellular tissue around them is generally a good deal condensed, but seldom to such an extent as to entitle it to the appellation of a capsule. Distinct vessels are very rarely perceived in them; nor is it possible to discern any nerves.

Scirrhus is susceptible of considerable variation of structure, depending chiefly upon the quantity of the adventitious matter, its vascularity, its mode of aggregation, and the pressure which is exerted upon it by the surrounding parts. A knowledge of this fact has led to the establishment of several subdivisions or varieties, of which I shall specify only a few of the more common and important, as the mammary, pancreatic, lardaceous, and reticular.

The *mammary* form of scirrhus exhibits an appearance similar to a section of the female breast, or a boiled udder. The tumor has a lobulated arrangement, and is intersected in various directions by fibrous bands of a dull white, bluish-gray, or pale straw color. It is ordinarily solitary, and rarely acquires much bulk.

The *pancreatic* variety derives it name from its resemblance to the pancreas. It is firm, dense, inelastic, and composed of numerous lobules separated by bands of cellular tissue, and resolvable into granules, or smaller bodies. The tumor in its bulk may equal an orange, or a large fist; it is occasionally inclosed in a distinct capsule, and usully selects the breast or lymphatic ganglions for its seat.

The *lardaceous variety* is met with chiefly in the lungs, uterus, and mammary gland. The adventitious matter is diffused through the tissues of the affected organ, which it compresses, alters, and finally transforms into a substance similar to itself. It cuts with considerable crispness, and closely resembles a section of the rind of fresh pork, having little or none of the fibrous arrangement of ordinary scirrhus. The extent of the deposit is generally inconsiderable; in some instances, however, it affects one fourth, a half, or even two-thirds of an organ, the weight of which is always increased, while its form and dimensions commonly remain unchanged. However this may be, it may continue in a crude state for many years; at length, however, it takes on softening, and then pursues the same career as ordinary cancer.

One of the most common varieties of scirrhus is the *reticular*, the ordinary seat of which is the mammary gland, though it may also occur in other parts, as the stomach, lymphatic ganglions, lip, eye, heart, and anterior mediastinum. It is distinguished by its white or bluish reticular figures, by its large bulk, and by its tendency to assume a lobulated form; its consistence ranges between scirrhus and encephaloid. This form of cancer is composed of gray globules, imbedded in the meshes of a fibrous network, which is not seen until after their removal by scraping or maceration. The reticular figures, which give this variety of scirrhus its distinctive features, are white, or yellowish-white, and of a very irregular shape; sometimes they have an arborescent arrangement, at other times they appear in spots. They are peculiar formations, not dilated vessels with hypertrophied walls, such as are sometimes seen in the ordinary form of the disease, but they are produced by the inlaying of white grains in the gray mass.

*Chemical Constitution.*—The chemical composition of scirrhous matter has been examined by different chemists; one of the most complete analyses is that published by Foy, and which is as follows:—

| | | | |
|---|---|---|---|
| Albumen | 42.00 | Carbonate of Soda | 5.00 |
| White fatty matter | 5.00 | Lime | 6.60 |
| Red fatty matter | 3.25 | Magnesia | 0.85 |
| Fibrin | 5.85 | Hydrochlorates of Potassa | 4.10 |
| Water | 5.00 | Soda | 3.25 |
| Oxide of iron | 1.65 | Tartrate of soda | 0.85 |
| Subphosphate of lime | 16.60 | | |
| | | | 100.00 |

Hecht[1] found seventy-two grains of scirrhous breast to contain—

| | |
|---|---|
| Albumen | 2 grains. |
| Gelatine | 20 " |
| Fibrin | 20 " |
| Fluid fatty matter | 10 " |
| Water | 20 " |

Seventy grains of scirrhous uterus were found, by the same chemist, to be composed of—

| | |
|---|---|
| Gelatine | 15 grains. |
| Fibrin | 10 " |
| Fatty matter | 10 " |
| Water | 35 " |
| | 70 |

By comparing the analysis of Hecht with that of Foy, it will be perceived that it exhibits striking peculiarities, consisting mainly in the presence of a considerable quantity of gelatine, in the small proportion of albumen, and in the entire absence of inorganic salts. It will also be noticed that the results obtained by Hecht in his two examinations differ remarkably from each other. Thus, in his first analysis, albumen is enumerated as one of the ingredients, while in the second none of this substance appears to have been detected; there was also a greater proportion of fibrin and gelatine, and a much smaller quantity of water. Müller agrees with Foy in stating that scirrhus rarely, if ever, contains any gelatine, while Morin and Collard de Martigny unite with Hecht in asserting that it is an invariable elementary principle of this deposit. On the whole, it may be fairly inferred, from the preceding statements, that the intimate composition of scirrhous matter varies considerably not only in different parts of the body, but likewise in different stages of the disease, and probably, also, in different parts of the same preparation.

*Period of Life.*—Scirrhus rarely appears before the age of thirty, in which respect it differs strikingly from encephaloid. It is much more common in women than in men, and its favorite period of attack is from the fortieth to the fiftieth year. It rarely occurs before the period of puberty. My son, Dr. S. W. Gross, has recently reported a well marked case of cancer of the liver, in a child under three months of age. The lymphatic temperament is supposed to predispose to it, and in some instances it seems to be connected with a hereditary taint, being transmitted from parents to their offspring. In the uterus and mammary gland, it has been repeatedly observed in several members of the same family.

*Seat.*—Scirrhus sometimes attacks a considerable number of organs in the same individual, either simultaneously, or successively. In females, it is not uncommon to find both the breast and the uterus involved at the same time. It occasionally co-exists with encephaloid, tubercle, melanosis, and hydatids.

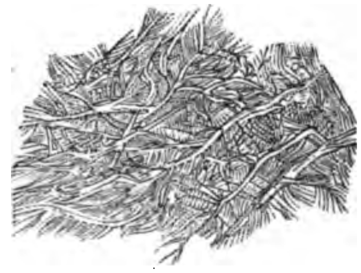
---

[1] Lobstein, Traité d'Anatomie Pathologique, t. i. p. 405.

The parts of the body most liable to scirrhus are such as have a glandular structure. In females, it is most common in the breast and uterus; in males, in the penis. In both sexes the lips, stomach, rectum, and liver may be mentioned as frequent seats of it. The spleen, lungs, and kidneys are seldom affected. It is also extremely rare in the bones; and it is doubtful whether it ever occurs in the cartilages, in the serous, synovial, and fibrous textures, and in the muscles of voluntary life.

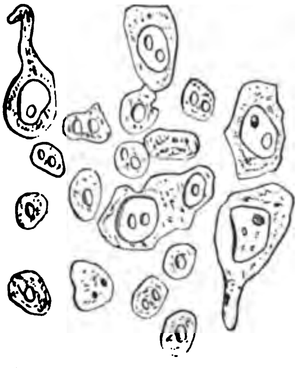
*Organization.*—The mass of scirrhus consists of two distinct substances, a firm fibrous, and a softer granular. The former is of a whitish, cineritious or pale yellowish color, and is composed of a very irregular network, the meshes of which have no determinate shape or size. It constitutes the bed in which the granular element is deposited, and is seldom very apparent until the latter has been scraped away or removed by maceration. When this has been done, its filaments are found to intersect each other in every direction, as is seen in Fig. 40, and to form the cells, meshes, or cavities, just alluded to. The fibrous element is not always a new product, but merely the remnant of the tissues in which the morbid matter is seated. In scirrhus of the mammary gland, it seems to consist mainly of the pre-existing areolar substance and the lactiferous tubes, the former of which is very much condensed, while the latter are hypertrophied and filled with a colorless, whitish or yellowish matter. In scirrhus of the liver, on the contrary, the fibrous structure is generally of new formation, just as much so as the cells it serves to inclose.

Fig. 40.



Fibrous stroma of scirrhus.

Fig. 41.



Cancer-cells from the bladder, inclosing one or more large nuclei.—After Da Costa.

The softer part of scirrhus inclosed in the meshes of fibrous tissue consists mainly of cells and free nuclei lying in a transparent, slightly granular matrix. The cells are generally large, possessed of delicate but distinct cell-walls, are not very granular, and inclose one or several distinct nuclei. Their shape differs; some are round, others oval, others again caudated; their size varies from the $\frac{1}{1700}$ to $\frac{1}{800}$ of an inch in diameter. The nuclei in the cells are always large, and generally of an oval ape; they frequently contain one or several distinct nucleoli. Somemes many free nuclei are dispersed through the uniting substance. urthermore, in many cancers, both cells and nuclei rapidly change, ad we may observe, in addition to the structures described, oil-drops, ranules, crystals, and cells in different stages of degeneration.

The differently shaped cells, with large, distinct and regular nuclei, re almost always present in cancerous tumors. They abound in enephaloid, and have been regarded by many pathologists as the characeristic cells of cancerous tumors. Although so frequently found, ncerous tumors are met with which do not contain any of these so-alled "cancer-cells."

Concerning the proximate cause of scirrhus, nothing is known with ny certainty, notwithstanding the numerous attempts that have been ade to investigate it. We may, perhaps, assign it to a specific change f the blood, or to a general cachexy, which determines the local manistation of the disease. This latter may sometimes supervene upon xternal violence, such as a blow, kick or bruise. The deposit itself, believe to be nearly always preceded by inflammatory irritation of e part. The precise nature of this action cannot be defined: all that an be said about it is, that it is of a specific kind, and that it gives ise to the effusion of a fluid analogous to the fibrin of the blood, and ot very dissimilar, consequently, from the matter of tubercle.

The cancerous matter is deposited into the cellular structure of the rgans, which it gradually transforms, effaces, or destroys. That this is he case, is sufficiently evinced by what happens in the liver, kidney, and ancreas. Cases occasionally occur in which it can be discovered in ifferent stages of its development, so as to enable us to determine the anner in which it is effused. Thus, in the liver, the scirrhous mater generally appears in very minute, circumscribed points, correspondng with the granulations which are so abundantly found there in the atural state. At first, there is merely a change of color, the granuations exhibiting a pale grayish aspect, without the slightest deformity r change of volume. At a somewhat later period, the little tumors re observed to be of a white milky hue, hard, dense, crisp, opaque, rregularly spherical, and perfectly devoid of the original structure. ow these alterations, it is quite evident, can only be accounted for n the assumption that, in proportion as the heterologous matter is eposited into the cellular texture of the acini of the liver, their proer parenchymatous substance, whatever it may be, together with their essels, is obliterated by absorption, the pressure which the accidental ecretion produces being fully adequate to bring about this result. imilar phenomena may be witnessed during the development of scirhus in other organs.

From the foregoing remarks, then, it may be concluded, first, that he deposit of scirrhus is preceded by inflammation; secondly, that it as a great predilection for the glandular viscera; thirdly, that it arely occurs under the age of forty; fourthly, that the matter of which consists, when first deposited, strongly resembles that of tubercle; nd, lastly, that this matter is deposited always into the cellular tissue of our organs, in such a manner as to transform their proper parenchymatous structure.

*Changes.*—After having existed for some time, varying from a few months to several years, the scirrhous matter manifests a disposition to become soft, the process by which this is effected commencing, like that of tubercle, at different parts of the diseased mass, from which it extends in various directions, until the whole or the greater portion of it is broken up and dissolved. Some authors have contended that the liquefaction invariably begins in the centre; but that this is not true, my own experience abundantly attests. The process, in fact, may commence at any point, at the centre or at the periphery, or simultaneously in both these situations; and, as it advances, the superincumbent integuments crack at one or more places, through which the softened matter, now of the aspect of encephaloid, jelly, syrup, gum, or honey, is ultimately discharged. Ulceration, however, often occurs in scirrhous tumors long before the internal disorganization in question is accomplished.

A scirrhous ulcer possesses certain features which may be considered as characteristic. Generally, it is remarkably irregular in its shape, with a surface that is either cracked, fissured, or fungous, of a dark, reddish color, and of a peculiar glossy, œdematous aspect. Soft cauliflower excrescences sometimes sprout from it, so sensitive as to bleed on the slightest touch, or even of their own accord. The edges of the sore are of a reddish-gray color, elevated, everted, irregularly serrated, and harder in some places than in others, emitting more or less sanies on pressure. A deep excavation is occasionally formed, presenting the appearance as if a portion of the diseased mass had been lifted out of its bed. In cases which run their course very rapidly, the surface of the ulcer is frequently covered with a soft, grayish putrilage, of the most intolerable odor.

The fluid which bathes the surface of the ulcer is generally of a thin, bloody, ill-conditioned nature, with an odor approaching that of ammonia. It is always highly irritating, and the quantity discharged is sometimes surprisingly great. It always blackens silver, and imparts a green color to syrup of violets. Potash produces no change; but, on the addition of sulphuric acid, a peculiar gas is evolved, having many of the properties of sulphuretted hydrogen. This gas appears to exist in union with ammonia, and gives the fluid its peculiar fetid odor.

In this advanced stage of the disease, the skin around the ulcer is of a purple color—from the overloaded state of its capillaries—hard, puckered, somewhat tender on pressure, and easily eroded by the irritating discharges. By degrees, the ulcer spreads both in depth and diameter until at length the whole mass is involved in the disorganizing process, and the patient sinks under the exhausting hectic, caused by the profuse local discharges, and by the violent constitutional irritation. The lymphatic ganglions in the neighborhood at this advanced stage are almost constantly enlarged and indurated, and the tumor, instead of being movable and circumscribed, as it was in the early period of its growth, forms a hard, solid, undefined mass, firmly adherent to the surrounding structures.

Finally, scirrhus, after having attained a certain age and bulk, is occasionally assailed by destructive inflammation, followed by sloughing of the whole of the heterologous matter. I have witnessed this mode of termination only in one instance. The patient was an elderly lady, who had a medium-sized scirrhous tumor in one of the mammary glands, of several years' standing. Without any obvious cause inflammation set in, and in a few weeks the whole mass was lifted from its bed, as neatly as if it had been dissected out with the knife. Subsequently the disease showed itself in the axillary lymphatic ganglions, and made rapid strides towards a fatal termination.

## SECTION IV.

### ENCEPHALOID.

Intimately allied to scirrhus, in its mode of origin, yet differing from it widely in many of its essential features, is encephaloid, one of the most formidable and destructive of the heterologous formations. As the term indicates, this morbid growth bears a great resemblance to the cerebral tissue, not only in appearance, but also in chemical composition. Most writers designate this disease by a different appellation, according to the peculiar notions which they entertain of its composition and structure. Thus it has been called medullary sarcoma, fungus hæmatodes, soft cancer, medullary fungus, and cerebriform cancer. The term encephaloid seems, on the whole, the least objectionable, and I shall therefore retain it on the present occasion.

Encephaloid, compared with some of the other heterologous formations, is a very frequent disease, occurring in both sexes and at every period of life. It is not peculiar to the human subject, but is occasionally witnessed in the inferior animals, especially the horse, ox, and dog. It may exist alone, or be associated with tubercle, scirrhus, melanosis, hydatids, and other growths.

*Varieties of Form.*—The foreign matter is deposited in the different organs in three distinct varieties of form, the tuberoid, the stratiform, and the infiltrated.

In the *tuberoid* variety the heterologous matter appears in the form of a circumscribed tumor, from the size of a pea to that of an adult head. In its shape it is generally irregularly rounded, ovoidal, or even quite flat, according to the amount of pressure exerted upon it by the surrounding parts. It is composed of different lobules, which are enveloped by a thin covering, and separated from each other by delicate membranous partitions. The outer covering, evidently derived from the neighboring cellular tissue, is usually not more than half a line in thickness, easily torn, semi-transparent, and of a light rose color. From its inner surface are detached numerous processes, which, dipping into the morbid growth in various directions, form so many cavities for the reception of the new deposit. These septa, which are sometimes remarkably rough and shreddy, always become more obvious after the pulpy mass is squeezed out. The cells which they form by their intersections are subject to much variety, and hence the peculiar lobulated shape which characterizes the morbid growth when occurring in parts that offer little or no obstacle to its extension.

Although the covering of encephaloid tumors is ordinarily derived from the pre-existing structures in their immediate vicinity, yet cases occasionally occur in which it is evidently of new formation. In such cases, the external envelop is generally very thin, or, indeed, almost film-like, easily lacerated, and of a grayish-color, with rough, shreddy surfaces. The interior septa are likewise less perfect, and the whole mass is commonly so soft as to yield to the slightest force.

The external envelop and its internal septa are abundantly supplied with vessels, which, pervading the morbid mass in different directions, assist in its growth, and in maintaining its vitality. These vessels, which always consist of a much greater number of veins than of arteries, are often remarkably large, convoluted, and easily traced to the neighboring trunks; their walls are exceedingly brittle, and hence the most trifling accident is liable to be attended with effusion of blood. Hence, too, the dark clots which are so frequently met with in encephaloid tumors. The cerebriform substance itself is easily squeezed out of its cavities, owing to its imperfect adhesion; and, interspersed through different parts of it, are frequently observed, besides the sanguineous depôts just adverted to, small cells filled with purulent matter, serum, or thin, sanious, and offensive fluid. I have seen as much as half a pint of reddish serosity flow from a single cavity of this kind, the inner surface of which had a peculiar honeycomb-like appearance.

When developed beneath the pleura and peritoneum, these tumors generally assume a pear-shaped appearance, the footstalk, by which they are attached, being often quite slender. In their volume they vary between that of a pea and a walnut; they are of a dirty straw color, and of a semi-concrete consistence. Although usually isolated, they sometimes occur in groups, and are always distinctly encysted, the capsule which covers them being either of new formation, or, as more frequently happens, derived from the serous membrane beneath which they are developed. This variety of encephaloid is uncommon.

The *stratiform* variety is exceedingly rare; I have met with it only in a few instances. It is found chiefly in the submucous cellular tissue of the stomach and rectum, and beneath the serous membranes, especially the pleura and peritoneum, in irregular patches, from the diameter of a pin-head to that of an American dollar. The deposit is generally of a whitish, cream-like color, tolerably hard and dense, and from the fourth of a line to the twelfth of an inch in thickness. Several such patches occasionally run together, forming an irregular layer of considerable extent, over which the serous membrane is indurated and puckered.

The encephaloid matter sometimes occurs as an *infiltration*. This ariety, which is likewise very uncommon, is seen principally in the terus, liver, and lungs, where it forms small, irregular masses, of a semi-concrete consistence. In the situations here referred to, the eterologous substance usually partakes more or less of the color of he parts in which it is deposited, and is often distinguished with dificulty from tubercular infiltration.

*Structure.*—The color of the heterologous substance, although geneally inclining to cineritious, runs through various shades of white and ed, having either the yellowish aspect of cream, the complexion of elly, or the black appearance of the crassamentum. In the tuberoid pecies, it is not unusual to see different sections of the morbid mass xhibit different shades of color, one part being pale, another cineitious, and a third of a deep brown, from the intermixture of clotted lood. It is seldom that the tumor has the pure white aspect of the medullary substance of the brain.

The consistence of this morbid growth is also subject to much variety. Though in general pretty nearly that of the fœtal brain, it is sometimes as soft as cream, and at other times as hard as fibro-cartilage. Like tubercular matter, it has been supposed by some to be originally deposited in a concrete state; but such an opinion is altogether untenable, for it cannot be supported even by a single argument from analogy. The error into which some anatomists have fallen, may be explained by the fact that the heterologous matter varies in its physical and chemical properties, not only in different organs of the body, but often, also, in different sections of the same mass. Thus, we frequently find encephaloid tumors hard and lardaceous in one part, semi-concrete and medullary-looking in a second, pulpy and cineritious in a third. That these differences of consistence, as well as of color, are the result, at least in some degree, of changes effected in the morbid substance after the deposition has taken place, cannot be doubted. It may therefore be assumed that this matter, like the tubercular, is never poured out in any other than a fluid state, whatever may be its consistence at the time it is examined, whether concrete, pulpy, or semi-liquid.

The structure of encephaloid, as just stated, is not always the same; on the contrary, it is often very much diversified, and is therefore usually arranged under different heads, as constituting so many varieties. Of these, the most common is the *hæmatoid*, or that form now generally known under the name of fungus hæmatodes. In this variety the morbid structure bears a close resemblance to the placenta, or to a mass of coagulated blood; it is of a brownish, mahogany, or pale brick color, extremely friable, and composed of small, intertwined vessels and cellular tissue, or of an amorphous, or laminated substance, not unlike the crassamentum, or a recent fibrinous concretion. In some instances the heterologous deposit has a granular appearance. It is always contained in distinct cells, of a rounded or oval shape, from the size of a billiard-ball down to the head of the smallest pin. These cells generally communicate with each other, and are formed by a fibrous network, either of new development, or composed of the pre-existing textures.

This variety of encephaloid is generally lobulated, and may consist almost entirely of hæmatoid substance; it is compressible, and slightly elastic, has a solid feel, offers little resistance to the knife, and the cut surface has a uniform red or mottled appearance, like a section of the placenta or a calf's liver. The outer surface of the tumor may be perfectly smooth, or rough and shaggy; the latter character being often rendered very conspicuous after maceration for a day or two in water. The hæmatoid tumor is exceedingly vascular, and frequently attains a very large bulk. It is sometimes invested by a distinct capsule, either of new formation, or, as is more generally the case, derived from the surrounding parts; and interspersed through it are occasionally clots of extravasated blood, or cells filled with various kinds of matter. The most common seats of this growth are the mammary gland, the lymphatic ganglions, the extremities, the eye, brain, and liver. In the latter organ it sometimes exists in considerable numbers, from the volume of a grain of mustard to that of an orange, and composed entirely of a red, bloody, semi-concrete substance, easily enucleated from the containing bed.

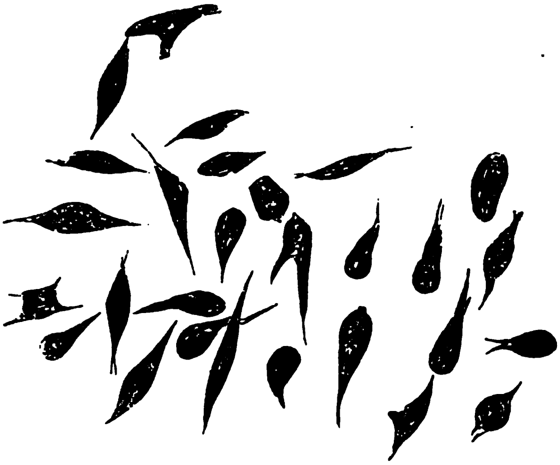
The cerebriform matter may be quite hard, inelastic, or nearly so, white, and perfectly uniform when cut, like the interior of a potato. When this is the case, it constitutes what has been called the *solanoid* variety of cancer. The morbid growth may also resemble the structure of the kidney, and is then termed *nephroid.* "When the fibrous intersections are distinct, broad, and fascicular, the divided mass has more the appearance of a cut turnip, and is therefore called *napiform.*" Müller has described a variety of encephaloid under the name of *hyaline*, in reference to its transparent, vitreous appearance. This character, however, is not constant, and the term *fasciculated* is therefore preferable. This form of the disease is not very common, and is usually distinguished with difficulty from the reticulated variety of scirrhus, described in another page. It resembles, in its general features, the nephroid variety of cancer. The tumor is highly vascular, and is composed of extremely pale, transparent fibres, which follow no fixed direction. The fibres are often arranged in tufts, which, being intertwined with each other, give the morbid mass a lobulated aspect, both externally and internally.

Encephaloid tumors, apparently quite similar in their physical and chemical properties, frequently exhibit, on *microscopical* inspection, marked peculiarities. They generally, however, show corpuscles and a stroma. The corpuscles or cancer-cells are exactly like those found in scirrhus, and like these their shape varies materially. Some are round, others ovoid, caudate, or with several prolongations. Nearly all contain large, distinct oval nuclei, many even nucleoli; both of which may be found lying free in the basis-substance. The cells or nuclei may sometimes be observed to be filled with granules of oil or even with pigment. The caudate bodies contain either a granular substance without any evident nucleus, or a nucleus with one or more nucleoli.

Their sides are prolonged into fibrils, or filaments, as represented in Fig. 42.

The cellular elements are suspended in a liquid, slightly granular, homogeneous blastema, which with the corpuscles forms the ordinary cancer juice. At times there is a firmer stroma for the cells, of indistinctly fibrillated, or even of distinct fibrous structure, forming a network in which the cancerous elements are deposited. The growth of the stroma of cancer, and its exact shape have been recently carefully investigated by Rokitansky,[1] who states that in the firmer varieties of it two interlacing networks may be seen. One (Fig. 43) consists of tubes of a hyaline substance studded with cells, elongated nuclei, and long-drawn fibres, all lying parallel to the longitudinal axis of the stroma. The other (*a*) is formed of more opaque and granular hollow beams or tubes, with fenestrated gaps. These hollow beams, it is probable, contain cancerous elements. They gradually become more densely fibrillated, and from their sides spring hollow villous excrescences (Fig. 44) which may continue to grow and lead to a formation of the network, or may, by themselves giving off many and fresh dentritic vegetations, assume a villous form, such as is best seen in the variety of encephaloid called villous cancer.

Fig. 42.



Elongated and caudate cells from an encephaloid tumor.

Other elements met with in encephaloid tumors are granules, oil, pigment, and bloodvessels. The latter are generally very numerous, and mostly of new formation. Encephaloid matter, freed from the cellular structure in which it is contained, and before it has passed into its crude state, is of a viscid, jelly-like consistence, emits a peculiar spermatic odor on being heated, and readily coagulates in alcohol, in the acids, and in a solution of corrosive sublimate. It is miscible with water, and gradually liquefies when exposed to the action of the air.

---

[1] See Path. Anat., pp. 97, 264, and Reports of Vienna Academy, 1852.

Encephaloid is endowed with a high degree of vitality, arising from the peculiarity of its organization, one of its chief characteristics being its excessive vascularity, which is much greater than that of any other heteromorphous deposit. It is not improbable, though the circumstance is not demonstrable, that the tuberoid variety, at least, always possesses a double circulation, one being derived from its own intrinsic powers, and consequently proper to the morbid mass, while the other is common to it and to the surrounding structures. However this may be, its vascularity is unquestionably the main cause of its rapid growth and of the extraordinary bulk which it so often attains. For the same reason it is very prone to bleed; the new vessels, which are usually very imperfectly organized, being exceedingly liable to be ruptured on the slightest injury. Nerves probably exist in considerable abundance in encephaloid, though it is a singular fact that this disease is generally much less painful than scirrhus.

Fig. 43.

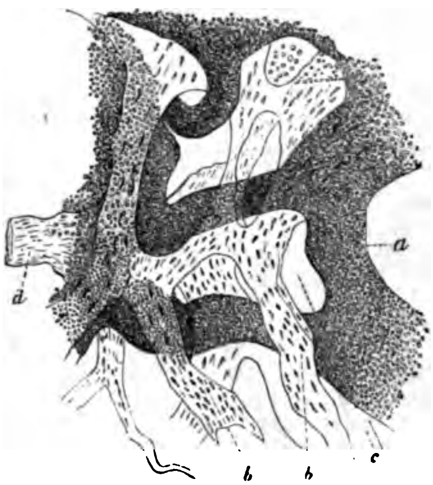
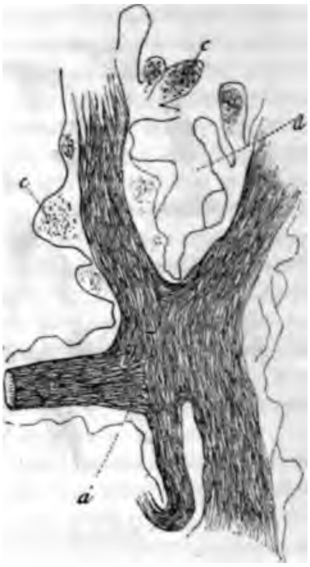


Fig. 44.



Figs. 43 and 44 represent so many stages of the development of the stroma of medullary carcinoma. After Rokitansky.

*Chemical Constitution.*—The chemical characters of this substance have been investigated by Hecht, Morin, Collard de Martigny, Maunoir, Wiggers, and Foy; the latter of whom has published the subjoined quantitative analysis:—

| | | | | |
|---|---|---|---|---|
| Albumen | 47.00 | Carbonates of | Soda | 2.75 |
| White fatty matter | 7.50 | | Lime | 4.00 |
| Red fatty matter | 5.35 | | Magnesia | 1.00 |
| Osmazome | 4.00 | Hydrochlorates of | Potassa | 2.70 |
| Fibrin | 6.50 | | Soda | 2.00 |
| Water | 8.00 | Tartrate of soda | | 0.35 |
| Oxide of iron | 1.35 | | | |
| Sub-phosphate of lime | 6.30 | | | 100.00 |

Compared with the analysis of scirrhus by the same chemist, the chief peculiarities here are the presence of osmazome, and the lesser quantity of inorganic salts. The fibrin exists nearly in the same proportion, while the amount of albumen and fatty matter is considerably greater. Foy and Maunoir have never found any gelatine in this substance; and Müller also observes that, except in one case of encephaloid of the kidney, he never detected any notable quantity of that principle even after subjecting the morbid matter to the most protracted boiling. On the other hand, Hecht, Morin, Wiggers, and Collard de Martigny, all agree in enumerating gelatine among the constituents of this morbid product. The first of these chemists appears to have found it entering very abundantly into the composition of crude specimens, and albumen into that of softened, while fat occurred in neither.[1] Phosphuretted fat has been discovered once in this species of growth by Wiggers; cholesterine by Gugert; and casein by Müller.

*Age, Sex, and Site.*—Encephaloid has been found in various organs at every period of life. It occasionally makes its appearance soon after birth, and it has also been seen as an intra-uterine affection.[2] On the other hand, it may manifest itself at a very advanced age. The following table, compiled for me by my friend Dr. Cassot, tends to show that the disease is most frequent between the twenty-first and fiftieth years. It is founded on an analysis of one hundred cases, in nine of which, however, the age is not mentioned.

TABLE I.

| Years. | No. of cases. |
|---|---|
| 1 to 3 | 8 |
| 3 " 7 | 4 |
| 7 " 14 | 5 |
| 14 " 21 | 9 |
| 21 " 30 | 20 |
| 30 " 40 | 14 |
| 40 to 50 | 18 |
| 50 to 60 | 7 |
| 60 " 70 | 4 |
| 70 " 75 | 2 |
| Age not specified | 9 |
| | 100 |

In the eye encephaloid occurs most frequently in childhood. I have seen at least a dozen cases at this period, and there is reason to believe, from the testimony of numerous observers, that at least five-sixths of those who die of this disease in this organ are cut off at this age. On the other hand, encephaloid of the liver, lungs, brain, testicle, mammary gland, ovary, uterus, bones, and lymphatic ganglions is more frequently noticed in adolescence, manhood, and old age, than at any other time of life.

The relative frequency of the disease in the two *sexes* has not been ascertained. Of the cases analyzed by Dr. Cassot, sixty-two were males, and thirty-six were females; in two, the sex is not specified. In my own practice I have seen the disease oftener in men than in women, but this may have been a mere coincidence. Of the influence of temperament, climate, and occupation in the production of encephaloid, our knowledge is altogether theoretical. The same remark is true in regard to the hereditary transmission of the disease.

---

[1] Cyclopædia of Surgery, vol. i. p. 595.

[2] Am. Journ. Med. Sci., vol. v. p. 204.

The *site* of encephaloid is a circumstance deserving attention. The parts most frequently affected are the eyes, bones, testicles, liver, lymphatic ganglions, and subcutaneous cellular tissue. Scarcely a single organ, however, is entirely exempt from its attack. It has been noticed even in the veins, especially in those of the liver, kidney, and uterus; and in many instances it is ingrafted upon polypous and other growths. The following table, constructed by Dr. Cassot, gives a view of the localization of the disease in different structures in 100 cases.

TABLE II.

| | | | |
|---|---|---|---|
| Skull | 3 times. | Groin | 3 times. |
| Eye | 10 “ | Thigh | 8 “ |
| Face | 3 “ | Knee | 8 “ |
| Neck | 4 “ | Leg | 4 “ |
| Shoulder | 3 “ | Surface of the body | 1 “ |
| Interscapular region | 1 “ | Fauces and larynx | 1 “ |
| Axilla | 6 “ | Lungs and thoracic cavity | 4 “ |
| Forearm | 5 “ | Liver and abdominal cavity | 9 “ |
| Hand | 1 “ | Uterus and pelvic cavity | 3 “ |
| Mammary gland | 6 “ | Penis | 1 “ |
| Chest | 1 “ | Scrotum and testicle | 14 “ |
| Abdomen | 1 “ | | |
| | | | 100 |

It is very common to observe the successive or simultaneous development of this disease in a number of organs or parts. Thus, it has been seen in various degrees of development, in the cellular tissue, bones, muscles, serous and mucous membranes, heart, lungs, thyroid gland, liver, spleen, pancreas, kidneys, supra-renal capsules, gall-bladder, and other structures.

*Tendency to reappear.*—Another remarkable feature of encephaloid is its disposition to reappear after extirpation, either at the original seat, in the structures immediately around, or in remote parts. This is not surprising when we consider that the disease is of constitutional origin, and that the deposits to which it gives rise are merely so many local manifestations of its presence in the system. In what degree the blood is disordered in this affection, or in what respect it favors the heterologous formation, we are entirely ignorant. An interesting case of encephaloid, well calculated to illustrate this renovative tendency, came under my observation in 1855. The patient, aged twenty-eight, was a married woman, and the mother of three children. Four years previously, a tumor began to form on the upper and outer part of the right thigh, and gradually increased until, in the course of ten months, it had attained the size of a large goose egg, when it was removed. The wound healed rapidly, but the tumor soon reappeared, and at the end of four months, when it was again excised, it had attained fully one-half of its previous bulk. In less than fifteen months two more operations were performed. The woman now came under my care, somewhat shattered in health, but without any apparent constitutional or lymphatic involvement, the tumor being hardly as large as a common orange. The knife was again used, the wound healing kindly as before. Shortly afterwards, however, the tumor returned a fifth time, when a sixth operation was performed, followed by death in a few weeks. A somewhat similar case has been observed by my friend

Professor Buchanan, of Nashville, and is related in the eighth volume of the *Western Journal of Medicine and Surgery.*

*Changes.*—Encephaloid disease, after having attained a certain development, may remain temporarily stationary, unaccompanied by any local suffering, until the part receives some injury, when it often grows with frightful rapidity. When seated in the subcutaneous cellular tissue, the tumor that is thus formed is at first quite movable, smooth on the surface, and devoid of sensation; but gradually, as the enlargement progresses, it becomes fixed, irregularly lobulated, elastic, and painful. If allowed to proceed, the diseased mass has a tendency to open and protrude, generally by ulceration, sometimes by sloughing, and occasionally by the bursting of an abscess in its interior. However this may be, the exposed surface is highly sensitive, and presents a dark reddish fungous appearance, being extremely vascular, very prone to hemorrhage, and constantly bathed with a thin, fetid, irritating sanies, the quantity of which is sometimes very profuse. In many instances the vessels of the morbid growth give way, causing an effusion of pure blood; and this may be so obstinate and copious as gradually to destroy the patient. Occasionally there is a discharge of thin, glairy fluid, resembling the white of an egg. Such sores, besides being always highly disagreeable, never heal, from the inability of the parts to form healthy granulations. Sometimes the ulcerated mass sloughs as completely away as if it were dissected out; but these cases are uncommon, and are soon followed by a reproduction of the heterologous substance.

Obstinate hemorrhage is most apt to occur in such tumors as are of the class to which pathologists have applied the term fungus hæmatodes. In the eye and breast, for example, much more frequently than elsewhere, the morbid growth, if permitted to go on unrestrained, is extremely prone to bleed. The reason of this is obvious. The diseased mass is always composed, at least in part, of a vascular, erectile tissue, interspersed with encephaloid matter, and hence, as soon as ulceration sets in, hemorrhage, occasionally to an alarming and even fatal extent, is the consequence. The eroded surface, in these cases, is pale, livid, or of a mahogany color, and studded with large fungous excrescences, so grouped together as to resemble a cauliflower.

In this advanced stage of the disease, there is a rapid failure of the strength, the flesh wastes, the appetite declines, the patient is harassed with hectic fever, and the countenance assumes a peculiar yellowish, cadaverous hue. The lymphatic ganglions in the neighborhood, meanwhile, become enlarged, and converted into a substance resembling that of the original tumor. Two modes of explanation may be offered to account for this phenomenon. The one supposes that these bodies are affected merely sympathetically, causing their vessels to pour out encephaloid matter; the other, that this substance is carried to them by absorbent vessels coming from the affected part. Although this enlargement of the lymphatic ganglions seldom occurs before ulceration sets in, yet I have known it to exist at an early period after the development of the heteroclite mass, a good while, indeed, before the skin covering it manifested any disposition to give way.

## SECTION V.

### COLLOID.

A morbid product, consisting of a dense, fibrous, areolar structure, and of a soft, transparent, glue-like matter occupying its cells, was first described by Laennec, in the early part of the present century, under the appellation of colloid. It is also known by the term gelatiniform cancer, alveolar carcinoma, and gum cancer. By some this heterologous formation is regarded merely as a modification of the carcinomatous products already described; but, however this may be, I am satisfied, from careful personal examination, that it possesses sufficiently distinctive features to entitle it to separate consideration.

*Structure.*—Colloid is composed of two distinct elements, bearing to each other the relation of containing and contained parts, and differing, consequently, very widely in their physical and chemical properties, as well as in their origin and mode of arrangement. The first may be considered as the fundamental structure, the stroma, base, or framework, inasmuch as it gives form and solidity to the whole mass. It is made up of a fibrous tissue, hard, firm, slightly elastic, and of a dull whitish, or pale grayish color, the band-like filaments of which intersect each other in every direction, so as to inclose areolæ, cells, or spaces, calculated to contain the jelly-like matter that is deposited within them. The vacuities thus formed present every intermediate size, between a grain of sand and a common marble. In a specimen in my possession the smallest cells are hardly as large as the most delicate pin-head; some are as big as peas, and a few are of the volume of a Lima bean. In their figure they are rounded, ovoidal, or angular; many of the most capacious are multilocular, or divided by thin fibrinous septa into different compartments. In regard to their number, the loculi are too variable to admit of any definite statement. Hundreds frequently exist upon a surface not more than an inch square, and, in masses of large size, the probability is that there are myriads, many of them being so minute as to be invisible with the naked eye.

The cystiform structure now described is easily recognized in all specimens of the disease, and constitutes, in fact, one of its distinguishing anatomical peculiarities. The cells are lined by a thin, transparent membrane, more delicate than the pulmonary pleura, smooth on its inner surface, and intimately attached by the other to the surrounding parts by short, dense, cellular substance. This lamella is evidently of a serous nature, but differs from a natural sac of that name in being perforated at one or more points, so that a probe may be readily passed from one cell into another. In the large cavities the inner surface of the cyst has sometimes a wrinkled or corrugated appearance, especially when it is partially collapsed. Very few, if any, of the loculi, so far as my observation extends, are completely shut, and hence a colloid tumor may be said to bear a very close resemblance to a sponge, the cells of which communicate everywhere with each other. The vesicular and tuberoid arrangements of colloid are exhibited in Figs. 45 and 46.

Fig. 45.

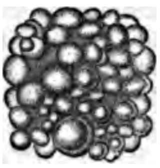
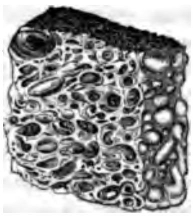


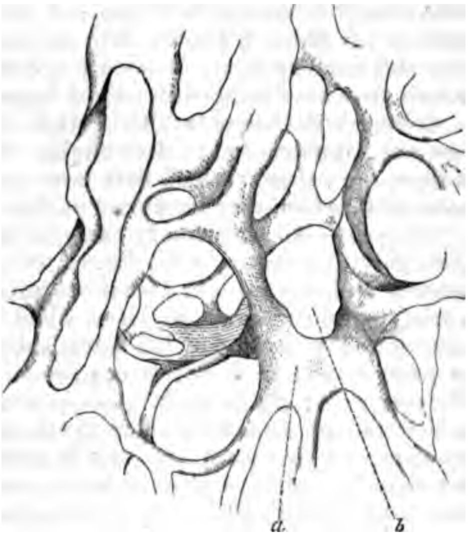
Fig. 46.



Colloid tumor. Fig. 45. External appearance. Fig. 46. Internal structure. From a preparation in my collection.

Microscopically examined, colloid substance appears homogeneous, sometimes slightly granular; occasionally it forms large irregular plates. In this basis-structure are imbedded nucleated corpuscles, and, as first pointed out by Müller, large parent-cells, inclosing several smaller cells. Occasionally cancer-cells, as seen in scirrhus or encephaloid, are mixed with the morbid mass; yet colloid matter may be found without any of the elements regarded as characteristic of cancer. Peculiar concentric corpuscles are met with in the gelatinous infiltration of the spleen, heart, and thymus. The stroma of colloid consists of a delicate fibrous tissue, inclosing the peculiar jelly-like mass, or of a firmer multilocular fibro-membranous structure, as seen in Fig. 47. At times the colloid material occurs as an infiltration into tissues.

Fig. 47.



Stroma of colloid.

The grand constituent of this morbid growth is an unorganizable product, the consistence of which varies from that of soft jelly, or a solution of starch, isinglass, or arrowroot to that of custard, half dissolved glue, or semi-concrete albumen. It is generally of a pale straw color verging on green, perfectly clear, transparent, slightly tremulous, and somewhat tenacious or clammy. In the older cells it is sometimes as firm as moist cheese or the white of a boiled egg, opaque, and of a light yellowish hue, interspersed with dark points. It has also been found of a reddish color, similar to that of currant jelly, and a variety of it has been described which is of pearly whiteness, with a granular fracture and feel, and the chemical constitution of caseum. Whatever, however, may be its appearance or consistence, it has seldom any adhesion to the containing cyst, and is therefore always easily enucleated: it is only when the matter is very hard, or intermixed, as it sometimes is, with flakes of lymph, that it is detached or scraped away with difficulty.

Very little cellular substance enters into the composition of colloid. Whenever it occurs in a free state it is very short, firm, and of the same color as the fibrous septa which it serves to unite to each other and to the lining membrane of the cells. The vascular system of this morbid product has not been so thoroughly investigated as it deserves to be. That it is usually well developed, however, is apparent, not only from the large size and great number of the vessels themselves, but from the extraordinary bulk to which this cancerous formation occasionally attains. In the specimen previously referred to, vessels were seen in every direction, some of them remarkably tortuous, and from two to three inches in length by a line and a half or more in diameter. Always limited to the fibrous septa and the cysts inclosing the jelly-like matter, they exhibit the same arborescent arrangement as in the natural structures. Their walls are quite thick in proportion to their calibre, and hence they are much less liable to rupture than the vessels of encephaloid, which are generally very thin and fragile. They commonly observe a tortuous, straggling arrangement, and, as they pass along to their points of destination, they deposit numerous twigs, which, penetrating the fibrous tissue in every direction, finally terminate in the walls of the cysts inclosing the jelly-like matter. Nothing is known, with any certainty, respecting the relative size and number of the arteries and veins of colloid, or the manner in which they are arranged in regard to each other.

Colloid is doubtless furnished with nerves and absorbents; but no one has yet succeeded in determining their origin and mode of distribution, the relation which they bear to the arteries and veins, or the manner in which they terminate in the cysts and membranous septa.

*Analysis.*—No satisfactory analysis has yet been made of colloid. The jelly-like matter, when freed from membranous tissue, yields no trace of real gelatine, nor does it contain any casein. In the pultaceous variety, however, as it has been called, the contents of the cells have been found to consist of the latter substance. Occasionally albumen is present, and fresh specimens sometimes yield a little osmazome. By protracted ebullition Müller obtained a small quantity of matter, which, though somewhat allied to the salivary principle, he considers as of a peculiar nature: it was not affected by any chemical reagent, not even by tannin, and its existence was established only by evaporating the fluid in which the heterologous substance had been boiled.

100 parts examined by Lebert and Wurz yielded—

| | |
|---|---|
| Carbon | 48.09 |
| Hydrogen | 7.47 |
| Oxygen | 37.44 |
| Nitrogen | 7.00 |

Not one of the other nitrogenized principles met with in healthy or in abnormal structures contain as small a proportion of nitrogen.

The jelly-like matter retains its natural transparency, color, and consistence, for a long time in spirits of wine. In my private collection is a section of a colloid tumor, which has been in alcohol since Janury, 1840, without having apparently undergone the slightest change f any kind.

*Varieties of Form.*—Colloid occurs in three varieties of form, in diseminated masses, as a distinct, solitary tumor, and as an infiltration n the substance of the part affected. Concerning the relative frequency f these varieties of form we have no positive information, but the probability is that the last is the most common.

Disseminated masses of colloid are met with in the greater and lesser omentum, the mammary gland, the testicle, and in osteo-sarcomatous umors. They are of a rounded form, compressible and elastic, smooth, and of a pale greenish, whitish, pearly, or grayish color; they are generally about the size of currants, grapes, or marbles, and their nterior is often divided into two, three, or even four lodges or compartments. Their number varies in different instances from one to several hundred. Small bluish veins are sometimes observed on their surface.

When occurring as a solitary tumor, the colloid matter is collected nto rounded masses of various sizes, agglomerated together, and united by dense cellulo-fibrous tissue. The number of tubercles may range from half a dozen or less to several thousand. The surface of the morbid mass is lobulated, botryoidal, or mammillated, according to the volume and arrangement of the component cysts. Occasionally it bears a strong resemblance to the exterior of a pudding-stone. The color varies with the nature of the contained matter; a pale geeenish is the most usual tint; but it may be pink, bluish, yellowish, or pearly white, or all these shades may coexist in different sections of the same preparation. In its weight it ranges from a few ounces to several pounds; in its volume, from an orange to a fist, a cocoa-nut, or even an adult head. When cut, it emits a sound not unlike fibro-cartilage; it has a dense, solid feel, when deprived of its jelly-like matter, but as long as the vesicles are distended, it is rather soft, distinctly elastic, and even fluctuating, particularly over the larger cysts. A thin, delicate capsule, composed of condensed cellular tissue, occasionally invests the morbid mass, and isolates it from the surrounding parts. This form of the disease is most common in the peritoneum, the greater and lesser omentum, in the ovary, and in those affections of the bones known under the names of osteo-sarcoma and spina-ventosa.

In the third variety, the adventitious substance is diffused through the tissues of the affected organ, which it gradually subverts, so that in time it loses all trace of its primitive organization. The cysts are usually very small, frequently not larger than grains of sand or mustard seeds, and the jelly-like matter, generally of a pale bluish tint, also exists more sparingly than in the other forms of the disease. When an organ, as, for example, the stomach, is transformed into this substance, it almost always retains its shape, however much it may be changed in its size and consistence. The most common seat of the infiltrated variety of colloid is the stomach, but the disease has also been observed in the small bowel, rectum, omentum, and the inferior extremity of the uterus.

*Quantity.*—The quantity of the heterologous matter is extremely variable, and is greatly influenced by the nature of the part in which it is deposited. In the bones and on the free surfaces of the serous membranes it often aquires considerable bulk, owing to the slight resistance opposed to its extension. I am now speaking, not of individual tubercles, but of aggregated masses, formed during the progressive developpment of the disease. The former, as was before stated, are generally very diminutive, while the latter frequently equal the volume of an orange, a fist, or even of the head of an adult. Mr. Walshe[1] alludes to a colloid tumor of the omentum as large as a cocoa-nut, contained in the collection of King's College, London; Andral[2] describes one, removed by Roux from a man fifty years of age, which weighed nearly nine pounds, and Velpeau has seen large masses of this kind in the extremities. The most immense colloid tumor, however, of which I have any knowledge, fell under my observation in January, 1840, in a man forty-nine years old, whose body I examined along with the late Dr. Mason, of Cincinnati. It extended from the pelvis to the liver and diaphragm, surrounded the colon and part of the stomach, and concealed from view nearly the whole of the abdominal viscera. Its thickness was from two and a half to three inches; in length it measured nearly one foot, and in breadth more than eight inches. Its weight was estimated at twenty-five pounds. It was composed of thousands of agglomerated masses, from the size of a grain of mustard to that of a hickory-nut, and seemed to have been developed in the peritoneum, or in the great omentum, the latter of which was completely effaced. The liver was smaller than natural, probably from the pressure exerted upon it by the tumor, but in other respects it was perfectly sound, as were likewise the other viscera, both abdominal and thoracic. The disease was first noticed in July, 1837, as a small, hard, circumscribed tumor, just above the pubes.

Large colloid tumors are sometimes developed in the bones, and also, though more rarely, in the ovary. In the alimentary canal the disease frequently occupies a large extent of surface. In the stomach, for which, in common with scirrhus and encephaloid, it seems to have a marked predilection, it often spreads over one-third, one-half, or even two-thirds of its walls, transforming them into thick, solid masses, of a dense, gristly consistence. In the rectum, colon, and small bowel, its limits are generally more circumscribed.

*Seat.*—The seat of colloid appears to be much more limited than that of the other cancerous productions. The structures which are most liable to it are the alimentary canal, particularly the stomach and rectum, the omentum, ovary, lower jaw, and bones of the extremities. It has also been noticed, though rarely, in the mammary gland, uterus, and testicle. It sometimes affects several organs simultaneously, or in more or less rapid succession, as in the interesting case reported by the late Professor J. C. Warren, of Boston, in which colloid tubercles, from the size of a small granule to that of a pea, existed in immense numbers in almost every part of the body, especially in the bones, voluntary muscles, heart, mesentery, liver, and kidneys. They were of a whitish aspect, and gelatinous consistence. The disease may coexist with scirrhus and encephaloid, but I do not know that it is ever associated with melanosis or hydatids.

---

[1] Cyclopædia of Surgery, vol. i. p. 602.

[2] Path. Anatomy, p. i. p. 208.

*Period of Life.*—The period of life most obnoxious to this disease is from thirty-five to fifty. It has been observed in a patient of sixty-eight; and, on the other hand, it has been noticed several times in subjects under twenty; indeed, it is altogether probable that it may occur at a much earlier period. It has been witnessed in both sexes, but whether it is more frequent in one than the other, is not determined. The disease occurs in quadrupeds. I have met with two well-marked examples of it in the superior maxillary bone of the ox, the animals being otherwise perfectly healthy.

How this disease originates, or what its causes are, we are entirely ignorant. Its progress is usually slow, except when the tumor is very vascular, when it is apt to grow with great rapidity. It manifests no disposition to ulcerate, as is the case with scirrhus and encephaloid; is never the seat of hemorrhage or much pain; the general health usually holds out well; and the countenance rarely acquires that sallow, cadaverous hue so common in ordinary carcinoma.

## SECTION VI.

### EPITHELIAL CANCER.

A form of morbid growth, which has only recently been carefully studied, is that known under the names of epithelial cancer, epithelioma, or cancroid. It occurs especially on the skin and on mucous membranes, although it may invade more deeply seated tissues; for it has been found in lymphatic glands, muscles, and bones, and even in internal organs, as the liver and lungs.

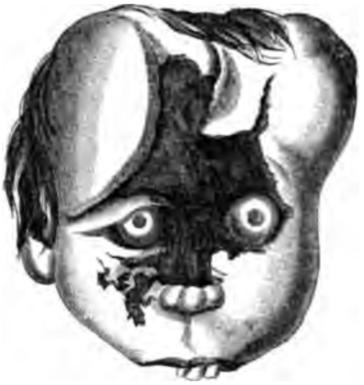
The most common seat of these epithelial cancers is the lower lip; next in frequency follow the cheeks, the tongue, the external organs of generation, the œsophagus, larynx, pharynx and trachea. They are met with as cauliflower excrescences on the neck of the uterus and in the vagina. On the scrotum they constitute the so-called chimney-sweep cancer.

The external appearance of these tumors on mucous membranes is generally that of an exuberant warty growth, of a pale whitish or red color. On the skin they are either smooth, or, more usually, present a peculiar tuberculated form, with ulcerations and dark red crusts on their exterior. The affected part seems enlarged and feels hard; if cut into, the section exhibits a firm whitish mass, and generally also enlarged papillæ; occasionally a soft juicy substance may be pressed out of the morbid structure. When the disease affects the cheeks the enlarged papillæ are not commonly met with, but they are very distinct in epithelial cancer of the lip and penis. These papillæ are of various length, shape, and thickness. Some are single, others united. On the penis they form a distinct outer growth resting on a white thick substance, which consists of the changed cavernous bodies.

Epithelial cancers soften and ulcerate; the sores thus formed are of irregular shape and covered with a creamy substance, or a dark red crust. The ulceration may give rise to complete destruction of the morbid tissue, and a hard cicatrice may be subsequently formed, although this is an unusual termination. The ulceration gradually extends beyond the tissues primarily diseased, and leads to disastrous consequences. Thus, cases have been seen in which the femoral artery was laid open by ulceration extending from the affected inguinal glands.

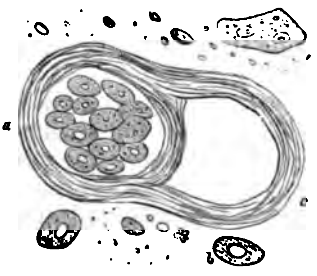
The ravages of this form of disease are well seen in the accompanying cut (Fig. 48). The affection began in the skin of the nose, whence it gradually spread to the cheeks, eyelids, and forehead, involving soft structure, cartilage, and bone, until the patient, after many years' suffering, was worn out by hectic irritation.

Fig. 48.



Epithelial cancer in a state of ulceration. From a specimen in my collection, presented me by Professor Buchanan, of Nashville.

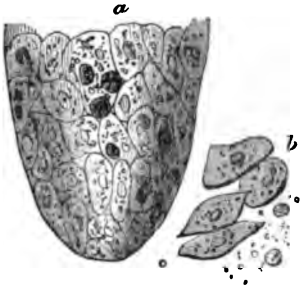
Fig. 49.



*a.* Cysts inclosing small cells; *b.* Large, rather round cells.—From a drawing by Dr. DA COSTA.

Minutely examined, these growths consist mainly of cells like pavement epithelium. The cells are large and flattened, angular, rounded, or with prolongations; a few are shrivelled and bent up. They usually contain one or two distinct nuclei, which are small in comparison with the size of the cell, although larger than those in healthy epithelium. They either lie in superimposed layers, held together by an intercellular substance, or by a delicate fibrous tissue, or they are found inclosed in peculiar cysts, apparently fibrous, although probably formed from compressed cells, and almost characteristic of these epithelial formations (Fig. 49). In some cases round cells with distinct large oval nuclei, such as are ordinarily met with in cancerous tumors, are observed. Mixed up with the cells are a great many free nuclei, granules, and occasionally crystals of cholesterine, pigment-cells and blood globules. The natural structure of the part is for the most part destroyed. The enlarged papillæ consist of loose fibrous tissue and bloodvessels very densely coated with layers of epithelial cells and free nuclei. Fig. 50 represents one taken from an epithelial cancer of the lip.

Fig. 50.



*a.* Papilla taken from an epithelial cancer, magnified 250 diameters; *b.* Separate epithelial cells.—After DA COSTA.

Epithelial cancers occur more frequently in the male than in the female. They are rarely seen before the age of thirty. Their most frequent cause is probably continued local irritation. Those on the lip are sometimes produced by smoking very short pipes. A case is reported by Dr. Da Costa, as occurring on the abdomen in the person of a shoemaker, which could be clearly attributed to a small board worn whilst working.

Very frequently they seem to originate in warts. Several cases have been collected which tend to prove that they are at times found where an hereditary predisposition to cancer exists.

Epithelial cancers are generally very slow in their growth. The duration of the tumor up to the time of operation, noted by Dr. Da Costa,[1] was in twenty-two cases as follows:—

| | 3–6 months. | 1 year. | 2 years. | 3 years. | 4 years. | 7–9 years. | 22 years. |
|---|---|---|---|---|---|---|---|
| On the lip | 1 | 1 | 4 | 2 | 1 | 1 | — |
| Face | 3 | 1 | 1 | — | 1 | — | — |
| Gums | — | — | — | — | — | 1 | — |
| Tongue | — | — | — | 1 | — | — | 1 |
| Trunk | — | — | — | — | — | 2 | — |
| Extremities | — | — | 1 | — | — | — | — |

Another peculiarity of these cancers is, that they do not often return when completely extirpated, and that they are rarely found except in the parts primarily involved. Thus, out of eighteen post-mortem examinations made by Lebert and Mayer, the disease could not in one single instance be found in any other part of the body. This fact, taken in connection with their frequent local origin, their greater curability, and the absence of the ordinary elements of cancer, has led many to deny altogether their carcinomatous nature, and to group them, under the term *epithelioma* or *cancroid*, as a class distinct from cancer; others, again, believe that the majority of these tumors are simple epithelial formations, but that cancerous structures may combine with them. The whole question of the true relation of these tumors to the ordinary forms of cancer, is as yet far from being satisfactorily settled.

---

[1] Remarks on Epithelial Tumors in Philadelphia Medical Examiner, April, 1852.

# PART II.

# SPECIAL
# PATHOLOGICAL ANATOMY.

# PART II.

# SPECIAL PATHOLOGICAL ANATOMY.

## CHAPTER I.

### OF THE BLOOD.

**Lesions of the Blood.—Nature and Formation of the Buffy Coat.—Cupped Appearance of the Blood.—Want of Coagulability.—Relative Quantity of Fibrin in Healthy and Diseased Blood.—Alterations of the Hematosine.—Lesions of the Serum, in Inflammation, Dropsy, and other Maladies.—Changes of the Blood, from Acceleration of the Circulation and Division of the Pneumogastric Nerves.—Appearances in Cholera, Fever, Chlorosis and Scurvy.**

ALTHOUGH I do not feel disposed to attach that great importance o the blood which the advocates of the old humoral pathology did, et it cannot be denied that it is the most essential fluid in the animal conomy, inasmuch as it furnishes the various materials which dis-ense vitality and nourishment to the different tissues, as well as igor to its several organs, serving thus, in the expressive language of ur medical ancestors, as the *pabulum* of life. From it all the solids e formed, and all the other liquids secreted; and hence it may stly be considered as the basis of every part of the complicated bric, as, without it, it would be impossible for any growth, whether althy or morbid, to take place. Pervading every portion of the dy, and penetrating every fibre, however minute, or however con-ituted—acquiring constantly new properties as it passes through e lungs, and losing them again as it meanders through the rest of e system—it is in the highest degree probable that, whilst it thus rtilizes the various structures, it may convey to them alike the ements of general health and of general disease. So long as it pre-rves its integrity, the impression which it makes upon the solids must of necessity be of a salutary kind, calculated to stimulate the whole machine, and to rouse it to the proper performance of its functions. On the other hand, any departure from this state, although so slight as to escape our notice, must be followed, it is reasonable to presume, by a corresponding derangement of the system. In inflammatory affections, it undergoes most important changes, exhibiting frequently, as will be seen by and by, a peculiar buff-colored aspect; in dropsy, it is thin and pale, like weak claret; in plethora, on the contrary, it is thick, remarkably tenacious, firm, and of a deep red complexion. If it be imperfectly elaborated, a morbid diathesis is established, which often lays the foundation of mortal maladies, and which is transmitted, in many instances, from the parent to the offspring. In this way "God visits the iniquity of the fathers on their children, down to the third and fourth generation," as is exemplified in the hereditary predisposition to arthritic, syphilitic, and tubercular diseases, mental imbecility, and a host of other disorders, as afflicting to the patient as they are generally perplexing to the practitioner.

The blood is a fluid of a dark reddish color, slightly saline to the taste, and of a specific gravity varying between 1.045 to 1.075. It consists of a fluid called sanguineous liquor, in which the corpuscles are suspended. The liquor is composed largely of water, and contains in solution salts, albumen, extractive matter, fat, and fibrin. This latter element is spontaneously coagulable, and plays the most important part in the formation of the blood-clot. I shall first describe the lesions in which the individual constituents of the blood are concerned, and secondly the alteration in reference to the entire mass.

The most remarkable change which the *fibrin* of the blood experiences, and one which we have the most frequent opportunities of observing, is that inflammatory condition which gives rise to what has been termed the *buffy coat*, or, from its frequent occurrence in acute disease of the serous membrane of the chest, the *pleuritic crust*. In general, it presents itself in the form of a thin lamella, of a pale straw color, which is spread over and closely adherent to the upper surface of the crassamentum, looking a good deal like a sheet of tallow. In some instances, it is of the color of a lemon-rind, nearly white, or greenish. The latter appearance is especially conspicuous in the blood of pregnant females, and has sometimes been considered, though erroneously, as an indication of that particular state.

The formation of the buffy coat is always consentaneous with the process of coagulation, appearing at first like an opaque, viscid film, of a reddish opaline tint, and of a consistence equal to that of mucus, which is either diffused over the whole surface of the fluid, or occurs in small insulated spots, looking like so many little islands in the midst of a body of water. Whilst warm, this substance is remarkably tenacious, and may be drawn out in the form of little filaments, which, on cooling, assume a whitish aspect. When fully formed, which, however, it is not under some hours, the buffy coat is dense, elastic, slightly diaphanous, strongly adherent to the cruor, which it covers, smooth on its free surface, and rough on the other. Now and then it is remarkably soft, and reticulated, or like the interior of a honeycomb, from the development and rupture of little air-vesicles.

If the buffy coat be carefully separated from the crassamentum, washed in cold water, and then immersed in strong alcohol, its elastic properties will be greatly augmented, and the membrane will present very much the appearance of a half-tanned hide, or of the proper uterine tissue during pregnancy. It is essentially composed of fibrin, along with a considerable but variable amount of albumen and serum, or what has been termed the *sanguineous liquor*, which may be squeezed out by pressure. The greatest analogy is thus seen to exist, both as regards appearance and chemical composition, between the buffy coat of the blood, as exhibited in certain diseased states of the system, and the substance that constitutes the adventitious membranes of the serous cavities.

Considerable diversity prevails in respect to the thickness of the buffy coat, depending on the intensity of the disease, and the nature of the affected part. Most commonly it does not exceed the eighth of an inch; but, in some rare instances, I have known it to be from three to six lines. As a general rule, it may be stated to be greater in plethoric subjects than in such as are weak, and in inflammation of the joints, serous membranes, and parenchymatous organs, than in the same disease in other structures.

The consistence of the buffy coat is also liable to vary. In typhus, scurvy, and chlorosis; in short, in all cachectic states of the body, it is generally soft and brittle, thin, iridescent, and of a dirty yellowish color. On the contrary, in simple inflammatory affections, it is usually highly tenacious, thick, and of a uniform opaline tint.

This peculiar appearance of the blood occurs in all inflammatory disorders, and, in fact, in almost every condition of the system in which there is a predominance of vascular action. It is usually found in the acute stages of pneumonitis, hepatitis, scarlet fever, smallpox, gout, rheumatism, and, perhaps, invariably in pleurisy; at least, I do not remember ever to have bled a patient laboring under this affection in whom the blood was not more or less buffed. It is also very generally met with in pregnant women, in dropsy, in chronic diseases of the chest and abdomen, in scurvy, in chronic gout and rheumatism, and in those who are subjected to frequent venesection. In chronic inflammation, in whatever tissue or organ seated, the buffy coat usually continues for a long time, especially if the disease be attended with much constitutional disturbance, reappearing at almost every repetition of the bleeding until the malady wholly subsides. The same phenomenon is witnessed in those affections in which the primary morbific impression seems to be made on the circulating current, as smallpox, for example, the virus of which is evidently absorbed by the vascular system. At the commencement of this disease, the blood is usually covered with a tolerably thick crust, but this crust seldom exists, or, at most, only in a very slight degree, prior to the establishment of the eruptive fever. When the exanthem is moderate, the quantity of buffy matter is commonly very small; in nearly all cases it continues until the scabs are perfectly dried, and occasionally even a few days later.

The relative frequency of the buffy coat in various diseases is exhibited in the following table, compiled from Andral:—

| Diseases. | No. of cases. | Perfect buffy coat. | Imperfect buffy coat. | Absence of buffy coat. |
|---|---|---|---|---|
| Acute amygdalitis | 12 | 9 | 1 | 2 |
| Bronchitis | 132 | 35 | 25 | 63 |
| Lead colic | 10 | 3 | — | 7 |
| Chlorosis | 11 | 7 | 1 | 3 |
| Cerebral congestion | 103 | 14 | 12 | 77 |
| Pleuritic effusion, recent and chronic | 27 | 7 | 9 | 11 |
| Intermittent fever | 32 | 5 | — | 27 |
| Typhoid fever | 187 | 10 | 30 | 147 |
| Cerebral hemorrhage | 22 | 2 | — | 20 |
| Hypertrophy of the heart | 72 | 11 | — | 61 |
| Albuminuria | 6 | — | — | 6 |
| Pneumonitis | 230 | 215 | 15 | — |
| Acute rheumatism | 134 | 125 | 5 | 4 |
| Chronic rheumatism | 50 | 11 | — | 39 |
| Measles | 11 | — | — | 11 |
| Scarlatina | 9 | — | — | 9 |
| Pulmonary tubercles | 203 | 140 | 13 | 50 |

Persons sometimes labor under intense inflammation, and yet the blood does not exhibit the buffed appearance until after they have been bled several times. The reason of this is not very obvious; but we may suppose that the system, in these cases, is so surcharged with blood, or that the heart and vessels are so exhausted that the usual nervous energy upon which the slow coagulation of this fluid depends is not imparted. At other times, the reverse of this obtains, the blood which flows first exhibiting the buffy coat, whilst that which is drawn towards the close of the operation will have little or none of it. This phenomenon is particularly apt to take place when the blood is allowed to issue slowly from a small orifice.

The manner in which the formation of the buffy coat may be modified by the state of the nervous system, is well illustrated by a case related by Hewson.[1] A young, robust man was bled during an attack of inflammatory fever. On opening the vein, the blood merely trickled down the arm, owing, apparently, to the fright of the patient; but, in a few seconds, it began to run quite freely. Three ounces were then received into a second cup, and a like quantity was immediately caught in a third. The individual now became faint, and was laid on the floor, when a few drachms more were taken in a fourth cup. Of these four measures of fluid, that which was removed last coagulated in three minutes, the first in twelve minutes, and the second in about twenty-two minutes. Neither of these had any inflammatory buff; but the blood received into the third cup began, in five minutes, to appear transparent on the surface; and, although it did not fully coagulate for upwards of half an hour, it had a remarkably thick, tough crust.

The formation of the buffy coat appears to be due to a loss of affinity etween the fibrin and the red particles, in consequence of which the itter, during the process of coagulation, gravitate towards the bottom f the crassamentum instead of remaining entangled in it, as they always o in the natural state. In this manner the top of the crassamentum ecomes covered with a colorless layer, the thickness and density of rhich vary according to the repulsive power between the two elementry constituents here referred to, the intensity of the disease, the state of he patient's system, and the degree of contraction of the inspissated ass. The reason why this separation does not occur while the blood s still contained in its vessels, is the constant motion to which it is ubjected, and which is incompatible with the coagulating process. here are certain external circumstances which greatly conduce to he formation of the buffy coat, of which the most important are a arrow receiver, and a large orifice, capable of furnishing from two to hree ounces of blood in a minute. If the receiver be broad and hallow, and the stream small, coagulation will occur before the red articles have time to detach themselves from the fibrin, or to graviate towards the lower portion of the crassamentum.

---

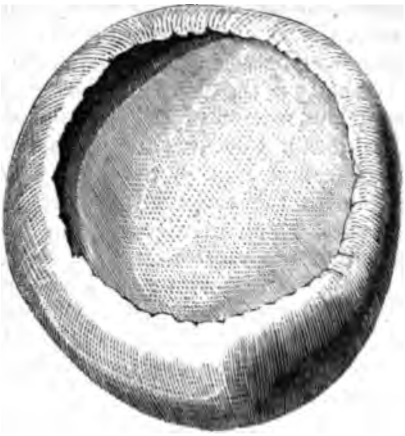
[1] On the Blood, vol. i. p. 82, *et seq.*

If blood be drawn simultaneously from both arms, it will generally e perfectly uniform, both as respects the quantity of the serum and he density of the cruor. Should the blood, however, run disproporionably slow on one side, there will be no appearance of inflammary crusts, whilst it will readily form on the blood which issues from he other, for the obvious reason that, in the former case, the liquid ill concrete before the red globules have time to disengage themelves from the fibrin; whereas, in the latter, the fluidity will be suffiiently protracted to admit of this occurrence.

It will be seen, from the foregoing remarks, that we cannot, as a eneral rule, consider the inflammatory crust as depending uniformly pon the shape of the receiver, the size of the orifice, or the volume f the stream, since all these circumstances merely modify, but can ever produce the buffy coat, unless the fluid is susceptible of it, or as undergone those changes which are necessary for its development. evertheless, it should be borne in mind, when we wish to draw any egitimate conclusions in relation to the inflammatory crust, that it is ll-important that the blood should not be exposed to too low a temerature, that the reciever should be rather narrow and deep, and, stly, that the orifice in the vein should be large enough to furnish t least two ounces of fluid in a minute. To effect this, the incision hould be about a line and a half in length, and the blood should run n a full, continuous jet.

When the middle of the buffy coat is depressed, or scooped out, s it were, it is said to *be cupped* (Fig. 51). This appearance is geneally limited to the upper surface of the crassamentum; but I ave occasionally witnessed it also upon the lower surface, though ever to the same extent. It is very common in nearly all diseases f a highly inflammatory character, such as pleurisy, peritonitis, rheuatism, and gout. Venous blood is not alone susceptible of being uffed and cupped: the same phenomena are observed in arterial blood, nd the only reason, perhaps, why they are not so familiar to us, is owing to the less frequent performance of arteriotomy than of venesection. The manner in which this cupped condition of the blood disappears, is well exemplified in a case which, a few years ago, came under the notice of my friend, Dr. Charles Woodward, of Cincinnati. He attended a married lady under a violent attack of pleuritis, for which she was bled several times. The blood which was taken on the first day of the treatment was deeply buffed and cupped. Twenty-four hours after the same appearances were exhibited, except that the clot was not quite so much depressed in the centre; in twelve hours more, the fluid was still buffed, but no longer cupped; and, at the fourth operation, performed three days after the first, it was neither buffed nor cupped.

Fig. 51.



Buffy and cupped blood, from a preparation in my collection.

This cupped state of the blood, as just hinted, is generally indicative of the highest degree of inflammatory action, yet, strange as it may seem, it is not unfrequently found in very opposite conditions of the system, as in persons who are greatly exhausted by hemorrhagic and other profuse discharges, and who do not evince the slightest symptoms of phlegmasia. Most commonly, it occurs in connection with inflammation of the serous membranes and the parenchymatous organs; being seldom present in inflammation of the mucous and dermoid textures.

Although it is not consistent with the plan of this work to enter into any therapeutic considerations, yet I cannot dismiss this branch of the subject without briefly inquiring how far the buffy coat should be regarded as an index to the abstraction of blood. It has been already seen that this phenomenon occurs under very opposite states of the system, in the most debilitated as well as in the most robust, in the highest degrees of disease as well as in the lowest, and in individuals who are in the enjoyment, apparently, of the most perfect health. The blood, in the advanced stages of pregnancy, is almost always covered with a layer of fibrin; and the same thing is generally observed in persons that have suffered from profuse hemorrhages of the stomach, lungs, or other organs. In individuals subjected to a course of mercury, the blood drawn from the arm is frequently as much buffed as in the most violent attacks of gout or pleurisy, notwithstanding the great reduction of the vital powers. The same effect may be produced simply by taking severe exercise. Thus, if a horse be bled immediately after he has run round a race track, the blood, in consequence of the hurried state of the circulation, will exhibit the buffy coat, whereas that previously abstracted will be perfectly free from it. Similar appearances have been repeatedly witnessed in the human subject. If these circumstances be coupled with the fact, that the buffy coat may be entirely absent, even in the most intense inflammation, the conclusion is obvious, that the phenomenon in question can neither be regarded as a certain test of morbid action either in the solids or in the vital fluid, nor a safe index of the propriety of bloodletting.

The fibrin is sometimes remarkably destitute of coagulating power. This is strikingly evinced in persons who are suddenly destroyed by lightning and electricity; a violent blow on the stomach, or severe injury of the brain; by the bite of venomous serpents; by acid vegetable poisons, such as prussic acid; excessive bodily fatigue; and even violent agitation of the mind. It is also frequently witnessed in Asiatic cholera, in scurvy, and in malignant fevers. Occasionally, too, it is present, and yet the individual is apparently in the enjoyment of good health. Under such circumstances, the most trifling injury may prove fatal, since the only means by which hemorrhage can be successfully combated is taken away, the blood refusing, in spite of all our efforts, to coagulate. Mr. Wardrop, of England, in a short but valuable treatise on blood-letting, published some years ago, has cited a number of cases of this kind, several of which came under his own immediate observation. In one of the instances alluded to, the patient died from hemorrhage, induced by the introduction of a seton in the side; in another, from a slight wound of one of the fingers; in a third, from the extraction of a tooth; in the fourth, from a superficial wound in the palm of the hand; and, in the fifth, from a bite of the tongue.

In 1839, I lost a male infant, five months and a half old, from hemorrhage caused by the division of the gum over the central incisors of the upper jaw; the bleeding came on in less than twenty-four hours after the operation, and, resisting all the means which I could employ for its suppression, proved fatal at the end of the fifth day. A few days before death hemorrhagic spots appeared in various parts of the body. The child had been born of healthy parents. I recollect a case of fatal bleeding from the extraction of a tooth. The patient was a servant girl, fifteen years old, of delicate constitution, who had never menstruated, and had been in bad health for about four months previously to her death. During the last six weeks she had been taking a variety of the most powerful emmenagogues, without any apparent benefit. In this state, Dr. Barnes was requested to extract the second molar tooth on each side of the lower jaw. Five days after the operation, the patient was attacked with profuse hemorrhage from the wounded sockets and surrounding structures, which persisted, notwithstanding the employment of the most energetic measures, until a short time afterwards, when she died perfectly exhausted. In compressing the parts with a piece of cork, the bleeding could be temporarily arrested, but the blood would soon ooze out from the mucous membrane of the cheek.

The late Dr. J. A. Swett,[1] of New York, has recorded a case in which this tendency existed in all the children, eighteen in number, of the same family. All but one had died from this cause, and he was suffering under profuse hemorrhage of the nose and rectum. Twelve sisters died before the age of twelve from bleeding of the uterus; two of the brothers had fallen victims to traumatic hemorrhage.

---

[1] New York Journ. Med. & Surg., July, 1840, p. 174.

Mr. Wardrop gives a curious case in which this peculiarity was hereditary. The patient was a boy, and the hemorrhagic tendency displayed itself when he was scarcely two months old. On several occasions, he nearly lost his life from the most insignificant wounds. His brother, twenty-two years old, was frequently afflicted in the same way. Of his five uncles, not one was free from this predisposition: three died after a division of the frænum of the tongue, one from the extraction of a tooth, and the other, although he suffered from the same disease, finally died from some other cause. His two aunts exhibited no signs of this diathesis; but, what is singular, all the male branches of their families, excepting one, were thus affected.

A still more remarkable case has been recently reported by Dr. Hughes, of Kentucky.[1] The predisposition here was associated with a rheumatic diathesis, and was satisfactorily traced as far back as five generations. It was confined exclusively to the male branches of the different families; but the females, nevertheless, invariably transmitted it to their offspring. Many of the individuals died in infancy and childhood, death resulting in some from the cut of the lancet; in some from accidental wounds; in some from internal hemorrhage; and in two simply from the application of blisters, the vesicles being filled with blood instead of water.

To what is this want of coagulating property of the blood to be ascribed? That it is owing, at least in part, to an insufficient supply of nervous power, upon the presence of which the vitality of the fluid in question essentially depends, is exceedingly probable. The direct influence of the nervous system on the blood was long ago contended for, and has been happily elucidated in modern times. It has been satisfactorily ascertained, that, whenever the pneumogastric nerves are tied in animals, the blood loses its property of coagulating, the coloring matter at the same time separating from the fibrin. But the influence of the nervous system is nowhere more strikingly evinced than in the effects produced by a severe blow on the cœliac ganglion. Here death is caused with the same rapidity as by lightning and the most subtle poisons; the blood, as was before stated, exhibiting precisely similar appearances, being unusually black, dissolved, and incapable of separating into serum and crassamentum.

It has been shown by Andral[2] and Gavarret, that in all acute inflammations a peculiar condition of the system is engendered, in consequence of which the blood is suddenly surcharged with fibrin. It does not matter what may have been the previous health, the supervention of an attack of this kind involves necessarily, in every case, an increase of this substance above the natural standard. This law obtains in animals, as the dog, horse, cow, and sheep, as well as in man. In the human subject, when the inflammation is fully established, the fibrin varies in quantity between 6 and 8; in some cases it rises as high as between 8 and 9; and occasionally, though rarely, it reaches 10½, or even 12½. The elevation dates from the very commencement of the morbid action, and may therefore be regarded as the pathognomonic sign of it. The only exception to this, so far as at present ascertained, is in utero-gestation, in which, both in the human subject and in the inferior animals, the blood, especially as the period of confinement approaches, always contains a redundancy of this substance, and displays a remarkable tendency to assume the character of inflammatory blood.

---

[1] Transylvania Journal of Medicine, vol. v. For a similar case, related by the same gentleman, see op. cit., vol. iv. p. 518.

[2] Andral considers the average proportion of fibrin in healthy blood as 3 to 1000. It may be found, however, as low as 2.5 or 2, and as high as 3.5 or even 4. The mean proportion of the globules he fixes at 127 parts in 1000; the extremes in the physiological condition of the system being 140 and 110. The solid materials of the serum are estimated at 80 parts in the 1000, and of these from 68 to 70 are pure albumen. The water of the blood is fixed at 790. See *Pathological Hematology*, translated by

It has been supposed that the tying of the pneumogastric nerves in the neck has the effect of diminishing the quantity of fibrin in a very notable manner. Dupuy having performed this operation, drew a certain amount of blood from the carotid artery, and ascertained that it contained twenty-one grains of fibrin. In a few hours after, the same amount contained only nineteen grains; at the end of sixteen hours, eighteen grains; and, at the end of forty hours, twelve grains. In a little more than two days from the operation, the horse died in a state of asphyxia, when the same quantity of fluid, still taken from the carotid, had only seven grains of fibrin.[1] The question naturally presents itself, was the progressive diminution, here spoken of, produced directly by the division of the pneumogastric nerves, or indirectly by disturbing the process of sanguification? In all probability the section of the nerve had nothing to do with it; for it is not at all unlikely, though this is not stated, that the animal at each bleeding lost more blood than was necessary for the purposes of the experiment; and, if this be admitted, the facts observed by Dupuy, though he accounted for them in a very different way, will be found to tally with the results of the experiments of Dr. Andrews, alluded to in another part of this chapter. A marked diminution of fibrin is occasioned in cases of scurvy, purpura, typhus, and in inveterate syphilis.

The *blood-corpuscles* are very liable to changes of different kinds. They may increase or diminish in number, or undergo dissolution, and thus permit the hæmatin to escape. In many maladies, this seems to disengage itself from the globules in which it naturally resides, and to percolate through the vessels into the different cavities of the body, or into the interstices of some of the organs. This separation frequently occurs in scurvy, in malignant dysentery, and in typhus

---

Drs. Meigs and Stillé, p. 30, Philada., 1844; also *Recherches sur les Modifications du Sang dans les Maladies*, par Andral et Gavarret, *Annales de Chim. et de Phys.*, t. lxxv., Nov. 1840.

[1] Andral, Anat. Path., t. i. p. 204.

fever, and is probably the cause of the passive hemorrhages and petechial spots which are so commonly met with in these affections. To the same circumstance is to be attributed the stained condition of the endocardium and the inner membrane of the vessels, which usually takes place within a short time after death, especially in warm weather, and which has sometimes been mistaken for the effects of inflammation. A diminution of the red corpuscles, either from their destruction, or from their not being formed in adequate numbers, often exists. This diminution, as might be anticipated from its apparent cause, is usually connected with those conditions of the system which are characterized by great debility, whether occasioned by impoverished living, protracted indisposition, or profuse hemorrhagic discharges. It is very constantly met with in chlorosis, in ascites, in organic affections of the stomach, and duodenum, in persons who are frequently bled, and in females who suffer habitually from menorrhagia. It would appear that women have always, comparatively speaking, fewer blood corpuscles, and less hæmatin in their blood than men, a fact which was first ascertained, I believe, by Lecanu, and which, he thinks, is attributable to their monthly evacuations. The following comparative view is the mean of his analysis made with blood drawn from ten adults of both sexes:—

| | Female. | Male. |
|---|---|---|
| Water | 804.37 | 789.32 |
| Albumen | 69.72 | 67.50 |
| Saline and extractive matter | 9.95 | 10.69 |
| Red globules | 115.96 | 132.49 |
| | 1000.00 | 1000.00 |

In the above diseases, the countenance is remarkably blanched from the want of hæmatin, the different tissues are literally exsanguineous, the nutritive function is badly executed, and there is great failure of the strength, with a disposition, in many cases, to cellular infiltration of the extremities. This state of things often persists for months, and occasionally, as in chlorosis, even for years. The blood, under such circumstances, is absolutely impoverished, being scarcely fit, from the absence of red particles, for the purposes which nature has assigned to it. Acute maladies produce, in effect, the same results, with this difference, that these two important elements of the vital fluid are usually much more quickly regenerated, especially when the individual has the benefit of free exercise and animal food.

There are some maladies, such as cholera, typhus, and plague, in which the blood is unusually black. The cause of this is not very obvious, but it may be supposed that several circumstances are necessary to its production. Amongst these, the most important, without doubt, is the partial abstraction of the vital principle of the blood, producing thereby a general impairment of the various functions of the system. In no organ is this disordered action carried to so great a degree as in the lungs, where, although the atmosphere still comes in contact with the delicate air-cells, the sanguineous fluid, from its exhausted condition and destitution of saline principles, is no longer susceptible of being properly arterialized. That this is true, is abundantly established by pathological anatomy, physiological experiments, and chemical analysis; for, as will be seen hereafter, the blood, in the diseases referred to, is generally extremely black, dissolved, highly carbonized, and sometimes almost entirely drained of its salts. In cholera especially, these states of the blood are amongst the most uniform occurrences; and it is to them that are to be mainly attributed the livid color of the skin, the embarrassed breathing, and the rapid exhaustion which those who are the subjects of the malady generally exhibit.

To this general statement several other facts, strongly corroborative of what has just been said, may now be added. In the first place, we may notice the effects that result from a division of the pneumogastric nerves, which are the governors, if such an expression be allowable, of the respiratory organs. This experiment is invariably followed by a suspension of the arterializing process, in consequence of which the blood, both in the veins and arteries, is always found of a black color after death. The same effect has been observed to be produced by merely tying these nerves. The blood also flows of a dark color when the carotid artery is opened after the phrenic nerves have been secured: the lungs, however, in this case, are not found heavy and engorged, as in the former. These facts, together with many others of a similar character that might be cited, clearly demonstrate the dependency of the arterializing process upon the nervous influence. If we abstract this agent, the vital fluid becomes darker and darker, until at length the lungs are rendered utterly incompetent to make any salutary impression upon it.

These changes, secondly, are generally produced more rapidly in proportion to the abstraction of the salts of the blood. The truth of this remark is strikingly corroborated by what occurs when saline fluids are injected into the veins of cholera patients, an operation which was performed successfully in several instances, both in this country and in Europe, during the prevalence of this disease. In the collapsed stage of this disease, when the individual is actually in a state of asphyxia, the skin cold and livid, the respiration labored, and the pulse imperceptible at the wrist, no sooner are the watery and saline materials restored, than the whole aspect of things is changed; the heart begins to act with increased vigor, warmth is diffused throughout the body, the breathing becomes easier, the strength returns, and the surface recovers its accustomed hue. Blood drawn from the arm, under these circumstances, will exhibit, if not its usual appearance, a very close approximation to it. Thus, then, there are at least two elements concerned in the production of the black color of the blood, namely, a partial abstraction of the vital principle, and a diminished amount of saline matter. Whether these are the only ones, I cannot pretend to decide; nor can we expect to be able to remove the veil which still enshrouds the subject, until animal chemistry shall have made further discoveries. No speculation on the part of the morbid anatomist, however ingenious, can be entitled to any confidence, or throw any real and substantial light upon the question at issue.

The increase of the white corpuscles of the blood and the decrease of the red give rise to a disease called *leucocythæmia*, or leucæmia. It may be detected by a microscopic examination of the blood and by the peculiar milky appearance of the sanguineous liquor when freed of its fibrin. Upon post-mortem examination soft clots are met with in the heart and the larger veins, consisting almost entirely of white globules. The liver, lymphatic glands, and spleen are generally found enlarged: the latter organ almost always.

The *serum*, like the cruor with which it is so intimately combined, is liable to various alterations, carried, frequently, to such a degree as to entitle them to be termed morbid. Thus it has been found to have the aspect and consistence of milk; to have streaks upon its surface like cream; to have oil in it; and, finally, to be remarkably destitute of saline and animal principles. These changes may occur exclusively in the serum; but there is reason to believe that, in the great majority of instances, the fibrin and blood corpuscles also change their relations.

The occurrence of *milky* serum is probably more common than the silence of the profession in regard to it would lead us to infer. It is usually met with in inflammatory disorders, and seems to be connected with deficient assimilating power of the digestive organs. In a case of milky serum, which fell under my observation in 1832, the patient, a young man, thirty years of age, had long been addicted to the intemperate use of ardent spirits, and at the time here specified he labored under symptoms of pleuritis, accompanied with headache, want of appetite, and considerable constitutional disturbance. The blood, as it issued from the vein in the arm, had a singularly dirty, turbid appearance, not unlike a mixture of chocolate and milk. It had scarcely been drawn ten minutes before it began to assume a white creamy aspect; and it finally formed a layer on the surface of the clot about the eighth of an inch in thickness. In the course of an hour some of this fluid was skimmed off and put in another vessel, in which it was allowed to remain for half a day. On examining it, at the expiration of this time, I found it to be slightly concrete, of the specific gravity of 1.026, remarkably unctuous, and of a strong saline taste. It readily coagulated on the addition of alcohol, corrosive sublimate, and the mineral acids, as well as on exposure to heat; and, on being viewed with the microscope, exhibited no appearance whatever of globules, circumstances which justify the conclusion that it was essentially composed of albumen. The cruor was somewhat more abundant than usual, and the quantity of serum of course less. It is worthy of remark, that, upon a repetition of the bleeding, twenty-four hours afterwards, the blood presented precisely the same characters as before.

Milky serum may also be occasioned, as already stated, by an increase of the white corpuscles, and especially by an inordinate amount of fatty matter. This may be discovered by treating the serum with ether. Becquerel and Rodier have shown that an increase of the phosphuretted fat generally occurs whenever the blood becomes strumous, whilst cholesterine is found in large proportion in old persons, in obstruction to the flow of bile, and in inflammation.

To the same class of cases ought to be referred, I apprehend, those

which the serum is said to have contained *oil*, of which several
ll-marked examples have been recorded by Dr. Traill, of Liverpool,
the twenty-fourth volume of the Edinburgh Medical and Surgical
urnal. In the last specimen which he has described, the serum was
a light straw color, cream-like in its consistence, and at first appa-
ntly homogeneous. On being kept, however, for a short time, it
agulated, and was poured with difficulty from the bottle in which it
s contained. On analysis, it yielded a large proportion of albumen
d oil, the latter of which was so pure as almost to burn when ex-
sed to the flame of a lamp.

It has been made a matter of inquiry to ascertain, if possible, the
use of this milky state of the serum. By some it has been attri-
ted to the admixture of fatty matter; by others, to the presence of
de chyle. That it is connected with deficient assimilating power
pears altogether probable, both from the nature of the diseases in
ich this peculiar state of the serum is found, and from the resem-
nce which this substance bears to the fluid just referred to. Chyle,
is well known, varies in appearance as the food has or has not con-
ned fatty matter: in the former case, its color is milk-white; in the
ter, it is nearly transparent. Soon after being drawn, it coagulates,
d subsequently separates into three parts, one solid, which rests at
bottom of the vessel, and looks like fibrin; another liquid, which
analogous to serum; and a third, which forms a thin layer on the
rface of the others, and is of an oily nature. If to this remarkable
ilarity between these two fluids we add the fact, that nearly all the
es in which milky serum has been observed were characterized by
rangement of the chylopoietic viscera, it renders it more than prob-
le, I think, that the appearance under consideration is owing to defi-
nt assimilation, by which a larger amount of fatty substance is
ained in the circulation than in the normal state. Where the fault
ually resides, whether in the mesenteric glands, in the thoracic duct,
in the lungs, or in all these organs, is a question which, in the pre-
t state of the science, it is impossible to determine. It is seldom
t we find this state of the blood associated with the buffy coat.

It has long been a matter of observation, that, in high degrees of
lammations, the watery part of the blood is more viscid and of a
per yellowish color than usual, presenting frequently the aspect
l consistence of synovial liquor. This appearance is less evident
en the clot does not float in, or occupy the centre of the fluid. It
been shown that the serum in these disordered conditions of the
stem contains at least twice as much albumen as in the healthy
te; a circumstance which readily accounts for its remarkable vis-
ity, its astonishing coagulable properties, its increased specific
vity, and its deep yellowish color.

In dropsical and cachectic persons, on the contrary, the serum is
erally much thinner, and of a paler hue, than in such as are strong
l plethoric. Its specific gravity is also much less, and there is a
sible diminution of albumen. Similar alterations take place in
sons who are in the habit of being frequently bled. The effects
s produced, though long known, have been placed in a very strik-

ing light by the researches of Dr. Andrews, of England.[1] The animal selected for the experiments was the calf, which was bled from a large orifice in the jugular vein, till symptoms of syncope were induced. The operation was repeated at intervals of twenty-four hours, during which the calf was generally once fed upon a mixture of meal and water. The appearance of the blood thus drawn was greatly altered at each successive abstraction. At the first operation, the cruor was very large, and a considerable portion of hæmatosin was collected from it; but, as the venesection was repeated, it gradually diminished in bulk, whilst its consistency augmented till the fourth bleeding, when it presented the appearance of a small contracted ball immersed in a great quantity of serum.

This experiment was frequently repeated on different animals, and uniformly with the same results; whence it may be fairly inferred that an increase of serum, with a corresponding diminution of crassamentum, is a very constant, if not an invariable effect of the repeated abstraction of this fluid from the system. Dr. Andrews farther ascertained that there is a perceptible decrease of albumen and salts at each bleeding; he states, however, that the diminution is very variable, and that it seldom exceeds one and a half per cent., even after the fourth operation. In the globules a still greater diminution occurs, being not unfrequently reduced to less than one-half their original number. These experiments are unquestionably of a highly interesting nature, and their results are well calculated to lead to useful precepts in practice.

Organic disease of the kidney is another of those conditions in which there is a deficiency of albumen with a consequent diminution of specific gravity. The reason of this is obvious. In nearly all cases of this disorder, the serum is of low specific gravity, and deprived of its animal principles, while the urine, which is loaded with them, is readily coagulable by heat, alcohol, and acids. Jaundice is another disease in which this fluid is morbidly affected, its most prominent change being its deep orange color.

How far, or in what respects, the *saline* ingredients of the serum are liable to be altered, are points concerning which there is no accurate information. That they frequently exist in excess, as well as in defect, does not admit of any reasonable doubt. The ill effects resulting from the long continued use of salt provisions are familiar to every army and navy surgeon.

Irritable ulcers, itch, and tetter, with other highly distressing and troublesome disorders, are often directly chargeable to such a mode of life. An increase of the salts has been observed in inflammation of several organs, and in high inflammatory fevers. On the other hand, in scurvy, Asiatic cholera, and in the malignant fever of tropical climates, it is extremely probable that there is generally a great deficiency of saline ingredients. In these disorders the blood remains dark even in an atmosphere of pure oxygen; but, on the addition of a solution of muriate of soda, it instantly assumes a florid hue; and is takes place even when the solution is very weak. Frequent eeding, as has been already seen, has also the effect of sensibly di-nishing the saline matter of the blood.

---

[1] London Medical Gazette, vol. xv. p. 592.

That the blood, considered as a *mass*, may be variously affected, is ually true as of its several constituents. All such changes, what-er they may be, should be carefully studied, as they correspond th so many particular morbid states of the system. Numerous ses have been published, in which the blood not only contained the ferent elements of the secreted fluids, but likewise a variety of other cidental products, such as pus, entozoa, and encephaloid matter. whatever way these substances may gain admission into the vessels, in whatever mode they may be there developed—and concerning ich I do not feel disposed here to speculate—it is certain that, by mbining with the blood, they not only vitiate it, but sometimes mpletely alter its physical, chemical, and vital properties. There n, indeed, be hardly any doubt that the elements of what are termed e heterologous formations may be found in the circulation, and at they are deposited subsequently in the various organs and tex-res, like other substances, by a sort of perverted action, induced by eir presence.

The ill effects of contaminated blood on the solids are well illustrated the operation of transfusion. This operation, devised by Lower, in 65, consists in transferring the blood of one animal into the veins of other, and has been performed, with complete success, upon the human bject. That no detriment, however, may accrue from it, it is neces-ry that the fluid thus used should be of a healthy character, otherwise will act as a poison. The truth of this assertion has been fully estab-hed by experiment and observation. Thus, a man, a flayer by occu-tion, whose case is described by Gendrin, was affected with putrid ver, attended with excessive prostration of strength, gangrenous stules, and hemorrhagic exudations from the mouth and nostrils. is breath, fecal discharges, and whole body exhaled a most offensive or; and the blood which was taken from the arm was unusually black, arcely coagulated, and displayed a remarkable tendency to decom-sition, being already quite fetid at the end of three hours and a half. nder these circumstances the vein was re-opened, and an ounce of ood being drawn, it was introduced into the cellular tissue of the groin a cat. The animal was soon seized with copious vomiting, followed dyspnœa, thirst, and extreme prostration, and, in less than seven urs, it died in convulsions. On inspection, the different viscera re found in a state of congestion and ecchymosis; the heart was soft d flabby; the blood was everywhere black and uncoagulated; the t pleuritic sac contained several ounces of sero-sanguinolent fluid; d the whole body, emitting a nasty, fetid odor, speedily began to trefy. A small quantity of blood, taken from the same patient, s next injected into the femoral vein of a dog. Similar phenomena sued as in the preceding case, the animal soon dying from the effects the morbid fluid. The same writer details some experiments which performed with the blood of persons affected with confluent small-x. In a very short time the most violent effects arose, and the dogs, the subjects of the investigations, usually died in from twenty to thirty hours, in consequence, apparently, of inflammation of the principal internal viscera.

To these experiments may be annexed the extraordinary case related by Du Hamel, of a butcher, who died of malignant pustule, four days after having held in his mouth the knife with which he had slaughtered an over-driven ox. Another person lost his life by accidentally pricking his hand with a bone of the same animal; and two women suffered severely merely from some drops of blood falling on them.

Not less conclusive are the results of the experiments of Dupuy and Lauret. These physiologists found that, on introducing blood taken from a horse affected with malignant carbuncle, into the veins and cellular tissue of another, they could readily induce the disease. Glanders have been communicated in a similar manner; and Dr. Hertrizch, of Berlin, asserts that hydrophobia can be readily produced by inoculating a sound animal with the blood of one that is rabid. A peculiar disease of the dog, called mange, has been transferred in the same way. These facts are highly interesting, inasmuch as they throw light on another subject, namely, the propagation of exanthematous affections by artificial means.

As the blood, in the examples above quoted, was capable of transmitting similar affections, no doubt can be entertained that it was really contaminated; and there is, moreover, the strongest ground for believing that fatal disturbance is often induced in this way, where we are little prepared to expect it, for aught we can discover in this fluid. The experiments, indeed, of Christison, Coindet, and others, of injecting poisonous substances into the veins of animals, conclusively show that, although the smallest quantity will frequently destroy life, yet the most delicate chemical tests will be insufficient to detect their presence in the vital current.

Inordinate acceleration of the circulation appears to be often followed by serious alterations of the blood. It was long ago noticed that violent muscular exertion will vitiate this fluid, render the perspiration strong and offensive, change the qualities of the urine, and terminate, if long continued, in intense fever, and even death. Dupuy has ascertained by experiments that the fibrin is either very sensibly diminished or otherwise altered, in animals that are subjected to excessive exercise; and Chaussier asserts that transfusion of the blood, under such circumstances, will be speedily followed by the development of gangrenous pustules and malignant fever. The deleterious effect on the blood produced by over-driving animals is well illustrated by the case narrated by Du Hamel, detailed in a preceding paragraph, and is still further exhibited in an instance which occurred in our own country. The case to which I refer is this: Some years ago, a number of fattened cattle were driven into one of the New England cities, and having been pressed too hard in a sultry day, were so overheated that some of them became quite exhausted. In this condition they were slaughtered, and the consequence was, as is stated by the reporter of the case, Dr. Fountain,[1] that nearly all who partook of their flesh were seized with typhus fever.

In Asiatic *cholera*, in fevers, and other maladies, the blood, contemplated as a mass, is very materially altered; but whether primarily or consecutively, is a question by no means decided. In the first of these disorders, the fluid is drained of its water, and, consequently, contains a disproportionate amount of albumen and blood-corpuscles; its color is excessively black, both in the veins and arteries; it coagulates very imperfectly; is greatly augmented in specific gravity; and the saline matter occasionally wholly disappears. Its fibrin may remain unaltered. Sometimes the serum contains even an increase of phosphates and salts of potassa.[2] One of the most extraordinary circumstances connected with the blood of cholera subjects is the presence of urea; this substance, however, is not always found, and it is usually most abundant where there is marked and long-continued suppression of urine.

The great diminution of the serum of cholera blood is easily accounted for by the rice-fluid discharges, which are often so excessively copious in this disease, and which are essentially composed of the same elementary principles, namely, water, animal matter, and neutral salts. According to the analysis of Lecanu, it contains neither caseum, nor bile, nor albumen, except in the form of flakes suspended in the ejected liquor.

The blood of *fever* patients has recently attracted a considerable share of attention among practical writers; but as yet our knowledge in relation to this subject is both limited and imperfect. In those who died of typhus at Brest, in 1757, the blood is said to have been grumous, black and decomposed, particularly in the portal vessels; and Dr. Tweedie, in his *Clinical Illustrations of Fever*, states that the crassamentum of the blood in this class of diseases, instead of forming a firm coagulum, is unusually soft, scarcely of the consistence of half-boiled currant-jelly, preternaturally small, and so destitute of cohesive power as to break on the slightest touch. In the typhus fever of Philadelphia, Dr. Gerhard[3] found the blood drawn during life, even at an early stage of the disease, of a very dark color, free from buffy coat, and with a large, soft coagulum. At a more advanced period, it exhibited the dissolved appearance described by various authors as characteristic of typhus or putrid fever. The blood, contained in the heart and arteries, was still more strikingly altered. In one case it is said to have been of the color and consistence of molasses, with minute fatty globules floating in it.

In *typhoid* fever the most frequent alterations in the character of the blood are, the imperfect formation of the buffy coat, the peculiar state of the clot, and the diminution of the natural proportion of fibrin. In one hundred and eleven bleedings, of which accurate notes were kept by Raciborski,[1] the buffy coat was entirely absent in forty-six, or existed merely in small, viscid, semi-transparent patches. The clot in all was more or less dark, frothy, and so soft as to break down under the slightest pressure, or even under its own weight. The serum was always diminished in quantity, and, without being actually turbid, was never so clear as in recent inflammation. In all these bleedings, which were performed upon twenty-one patients, the buffy coat was not perfect in a single one. The results of these observations are confirmed by the researches of Louis, Chomel, Bouillaud, Andral and Gavarret. All these writers testify to the black, grumous, and imperfectly coagulated condition of the clot, and the infrequency of the buffy coat. When present, the latter is usually very thin, soft, gelatinous, or infiltrated, and of a grayish, greenish, iridescent, semi-transparent appearance. The blood in the cavities of the heart is either entirely fluid, or it presents itself in the form of dark coagula, or, finally, it is converted into whitish or yellowish concretions. The proportion of fibrin is never augmented above the natural standard; on the contrary, it is generally very considerably diminished, especially in severe cases. The globules are less numerous than in healthy blood, but, in proportion to the quantity of fibrin, they always exist in a redundant state.

---

[1] Transactions of the Medical Society of the State of New York, vol. ii. p. 219. Albany, 1837.

[2] Lehmann's Chem., vol. i. p. 637.

[3] Amer. Journ. Med Scien., vol. xx. p. 298.

The globules are stated by some to be less, by others more numerous, than in healthy blood. They are generally increased at the commencement of the disease and subsequently diminish.

In the *yellow fever* of Philadelphia, in 1797, Dr. Rush[2] found the blood frequently quite dissolved, dark, grumous, and occasionally like the washings of flesh. In some of the cases the serum had a yellow color; and, towards the close of the disease, it was very common to see the cruor more or less sizy. This appearance, it would seem, generally portended a favorable issue. Similar states of the blood have been noticed by Ariquila, Bally, Palloni, and others, in the epidemic yellow fever of Spain; and, more recently, by Dr. Copland and Dr. Stevens, in the same disease, as it occurred in the West Indies. These authors describe the blood of yellow fever patients as semi-concrete, of a dark color, very poor in regard to its fibrinous and saline constituents, and extremely prone to decomposition. A state very analogous to this is observed in the plague, in epidemic peritonitis, and in the worst forms of erysipelas. On the other hand, in the elaborate work of my friend Dr. La Roche on yellow fever, it is mentioned that the blood, in the early stages, has been frequently found to be of a bright florid hue. This is ascribed by him to an increase of saline matter. The dissolved hæmato-globulin and the coloring matter of the bile account for the red or yellow color which the serum sometimes presents.

In the latter stages of the disease and after death, urea has been detected in the blood by Chasaniol. Yet experiments performed by Prof. Rogers, of this city, did not prove this substance to be present.

---

[1] Gazette Médicale, Feb., 1839.

[2] Medical Inquiries, vol. ii. p. 13.

cording to his observations, the blood drawn during the second ge of the disease contained the constituents of bile and an increased ntity of salts, but no urea.[1]

ur knowledge of the alterations which the blood experiences in se who die of *plague* is still extremely defective. This disease is ally very rapid in its march, and is characterized by the development of buboes, livid patches on the skin, great congestion of the cera, and effusions in the internal cavities. According to Dr. Bud,[2] of Turkey, the blood occasionally remains perfectly fluid, and er exhibits the buffy coat; it is unusually cohesive as it flows m the vein, and not unfrequently emits a peculiar odor. It was lyzed in three cases, and found to contain in 100 parts the following ingredients:—

| | | |
|---|---|---|
| Clot | Water | 35.576 |
| | Fibrin | .624 |
| | Coloring matter, with some fibrin, albumen, and fatty substances | 3.800 |
| Serum | Water | 54.420 |
| | Albumen and coloring matter | 4.704 |
| | Extractive | .252 |
| | Chloride of potassium and sodium | .408 |
| | Carbonate of soda and fatty matters | .216 |
| | Distinct traces of sulphurous acid. | |

In *plethora* the blood is unusually florid, the serum is more or less colored, and the clot, which rarely exhibits the buffy coat, is large, d of moderate firmness. The fibrin is not sensibly augmented; it nains within the natural limits, and does not even tend, in the ater number of cases, to mount to the highest standard. The serum much diminished in quantity, but its organic materials do not prent any particular change of proportions. The globules alone are in cess, and it is this circumstance which establishes, as far as it rects the blood, the character of plethora. In thirty-one bleedings rformed by Andral,[3] the globules stood at 141 as the average, at 1 as the minimum, and 154 as the maximum. Plethora may also ur simply by an increased quantity of the whole blood without one ment existing in greater abundance than another.

In *anæmia*, the reverse of plethora, the clot is very small, and floats an abundant, colorless serum. Instead of being soft, as might be pected, it is exceedingly dense, coherent, and often covered by chateristic buff. This state of the clot is the more marked in propor n as the anæmia is more thoroughly established. In confirmed cases blood may even be cupped, as was pointed out long ago by Borri. The fundamental character of anæmia consists in a diminution the globules, which often fall far below the normal limits. Thus dral[4] found, as the average of the proportion of the globules, in teen cases of incipient anæmia the cipher 109, and in twenty-four es of confirmed anæmia the cipher 65. In the spontaneous form of the disease the fibrin and solid matters of the serum may retain their normal relations; but when it supervenes on copious hemorrhages they are generally sensibly diminished. In a female, who had experienced repeated attacks of menorrhagia, the blood contained only 21 in the thousand of globules, 1.8 of fibrin, and 61 of solid matters of the serum, the proportion of water being 915.

---

[1] La Roche on Yellow Fever, vol. i. p. 174.

[2] British and Foreign Med. Rev., vol. viii. p. 551.

[3] Op. cit., p. 40.

[4] Op. cit., pp. 43–52.

In *chlorosis*, which may be viewed as the most perfect type of anæmia, the blood always experiences great changes, both as it regards its color, its consistence, and the relative proportion of its ingredients. It is almost always remarkably impoverished, and it is to this circumstance that is to be ascribed the blanched appearance of the skin and the diminished temperature of the body, which form such prominent features in its history. In the violent degrees of this malady, the crassamentum is soft and small, the serum thin and copious, and the corpuscles and hæmatin so diminished as scarcely to leave a stain when dropped on white linen.

*Jaundice* is another disease, in which, as was formerly stated, the blood is more or less altered in its properties. Not only the coloring principle of the bile, but even the resin of this substance has been detected in the circulation; and, as a necessary consequence, especially when the disease is of long continuance, every tissue of the body assumes a yellowish tinge, as well as, in many cases, the different secretions. In four subjects that I have had occasion to dissect within the last five years, all the soft parts, together with the whole of the osseous and cartilaginous systems, were of a deep orange complexion, from this cause. Even the brain participated in the change; for its substance was by no means of so clear a white as in the healthy state. When the bile is thus introduced into the general circulation, it appears to act as a sort of narcotic, inducing drowsiness and irritability. In other cases it generates fever, with headache, nausea, and loss of appetite. The presence of this fluid may be easily detected in the serum of the blood by adding to it an equal quantity of sulphuric acid, diluted with twice its bulk of water. The serum will thus change its yellow straw color for the characteristic green tint of bile.

But in no deranged condition of the body is the blood more remarkably altered than in *scurvy*. The relation of the different constituents of the blood in this disease has not, as yet, been satisfactorily determined: it is always unnaturally black, greatly deficient in cohesive power, and manifests but little disposition to separate into serum and crassamentum. In the latter stages of the malady, it has frequently the aspect and consistence of thin tar, treacle, or even of ink, the fibrin looking like wool floating in a dark, muddy substance, sometimes of a greenish tint. The blood that oozes from the mucous surfaces, in the form of spontaneous hemorrhage, exhibits similar appearances, showing, most conclusively, that it has undergone essential changes, both in its chemical properties and in its vital affinities.

The blood is generally considerably altered in pulmonary *phthisis*. Among the changes which occur in the progress of this affection the most conspicuous is an impoverished condition of this fluid, which is thin, light colored, and deficient in globules. The diminution of the bules is apparent at the very commencement of the morbid deposit, l reaches its minimum when the lungs are filled with cavities. The in is not changed as long as the tubercles remain crude, or as long as re is no inflammation in the parts around them. The very moment, vever, the softening process begins, it increases in quantity, and so tinues until the disease arrives at its third stage, when it attains its ximum. Andral weighed the fibrin obtained from thirty tubercu- patients in thirty-three different bleedings. In seven of these the ercles were crude, in nine they were softening, and in fourteen y were converted into abscesses. The seven patients of the first ies were bled, altogether, nine times; in seven times the fibrin was nd normal; and twice it exceeded the physiological standard, ing the numbers 4.8 and 5.1. It is worthy of note, however, that each of these two cases there was an inflammatory complication. ten bleedings performed on the nine patients of the second order, it is, when the tubercles were in a state of softening, the fibrin was excess in all, excepting one, sometimes very slightly, hardly reach- g 4, and sometimes varying between 4 and 5. In the fourteen cases the third class, this substance was in excess twelve times, and that a much greater degree than in the second series. The minimum as 4.0; the maximum 5.9.

The clot in the early stage of phthisis is generally rather small and nse, but does not exhibit any other peculiarities. When softening ts in, or cavities begin to form, it diminishes very sensibly, and is lmost always covered with a buffy coat. In the advanced stage of hthisis, the latter phenomenon is nearly as constant as in pneumonia, r acute articular rheumatism.

Modern research has not thrown much light on the condition of he blood in *carcinoma*. From facts, however, collected by Andral n the subject, he is led to infer that here, as in tubercle, the fibrin loes not increase until the matter is advancing to, or has actually eached, its stage of softening and destruction. The globules offer othing remarkable, except the progressive numerical diminution they ndergo in consequence of the defective nutrition and profuse hemor- hages so generally attendant upon the disease.

To the instances now cited, numerous others might be added, equally triking and satisfactory, in which the vital fluid is most seriously ltered, and transformed into substances very different, in their cha- acter, from those observable in the healthy state of the economy. ut to do this would far transcend the limits of the present work, if, ndeed, it would not be equivalent to writing a treatise on individual aladies. From the facts that have been presented upon the subject, it annot be doubted, by any one who duly and impartially contemplates , that the blood is a fruitful source of disease, or, in other words, that is susceptible of various morbid impressions, of which, in many nstances, it is the primary and original seat. Considering the vast urface from which the chyliferous vessels imbibe nutritious matter, nd the heterogeneous nature of man's food and drink, it is highly robable that the elements of disease may thus readily find their way nto the current of the circulation, and establish a prejudicial action in the solids, by which they, in turn, are disordered, and thrown into commotions incompatible with the harmony and well-being of the general system, or of some of its numerous members, tied together as they all are, figuratively speaking, by the closest consanguinity.

## CHAPTER II.

## CELLULAR TEXTURE.

Lesions.—Acute Inflammation.—Suppuration.—Gangrene.—Chronic Inflammation.—Induration.—Serous Infiltration.—Emphysema.—Degenerations.—Foreign Substances.—Guinea Worm.

NOTWITHSTANDING its apparently unorganized character, the cellular substance possesses the formative power in a very eminent degree. When destroyed, it is speedily regenerated; and in many instances, it supplies the loss of those textures that cannot be perfectly reproduced, as the muscular and tendinous. Every growth, in fact, whether normal or accidental, probably begins in the cellular substance.

The cellular tissue, diffused through every part of the body, and cementing together its various anatomical elements, is prone to numerous diseases, both of a primary and consecutive nature. Many of these lesions are of a highly interesting character, as affording an admirable insight into some of the most striking processes employed by the animal economy in repairing injuries, and in throwing off from the system such materials as have a tendency to impede the exercise of its normal functions. The principal morbid affections of the cellular tissue, which demand the special attention of the morbid anatomist, may be comprised under the following heads: 1, acute inflammation; 2, chronic inflammation; 3, induration; 4, morbid growths; 5, serous infiltration; 6, hemorrhage; 7, emphysema; 8, foreign bodies; and 9, the development of parasitic animals.

1. In *acute inflammation*, the cellular tissue is of a light reddish color, soft, spongy, and inelastic; its cavities are filled with an opaque, gelatinous fluid; and all the vessels ramifying through it are distended with blood. The nerves, too, are increased in their dimensions; and, when the irritation has been violent, it is not unusual to find small extravasations, produced by a real rupture of some of the capillaries. If the part affected contains much adipose matter, this will be variously modified, according to the degree of the inflammation; when moderate, the fat is commonly absorbed; if intense, it is broken down, mixed with the effused blood, and converted into a yellowish, pap-like substance, nearly destitute of its original features. These appearances, which denote a high degree of morbid action, always decrease towards the periphery of the inflammation; the redness also gradually declines

in intensity; the vessels are less minutely injected; and the tissue, although somewhat œdematous, preserves its accustomed elasticity and expansibility.

After some time, varying from three to eight days, softening takes place towards the centre of the inflamed mass, and the cells of the tissue become loaded with globules of *pus*. Subsequently the walls of these interstices are broken down, and the purulent matter is collected into one or more cavities. The swelling, in the mean time, becomes more circumscribed, the surrounding œdema diminishes, and the neighboring cells being agglutinated together by lymph, an effectual barrier is thus presented to the extension of the pus. The cellular substance immediately around the matter is of a dense, compact texture, forming a firm, resisting sac, the inner surface of which, at first red nd rough, gradually assumes a smooth, velvety aspect, not unlike ucous membrane.

Such are the ordinary characters, and such the usual termination of ircumscribed *phlegmonous* inflammation of the cellular tissue. Another ariety, much more formidable than the preceding, because much more estructive in its results, is the *diffuse*, so termed from its spreading endency. In whatever manner this disease arises, whether from xternal violence, phlebitis, poisoned wounds, phlegmonous erysipelas, r any other cause, it always attacks a large extent of surface, often nvading a whole limb, or even a considerable portion of the trunk. n most cases it terminates in suppuration, and sometimes even in loughing. The matter, which is generally of an unhealthy, sanious haracter, is not contained in a sac, nor is it restricted by an effusion of fibrin, as in the phlegmonous form, but is extensively diffused, and often causes great havoc in the adjacent structures.

When diffuse inflammation occurs in debauched, worn-out individuals, as it is apt to do when it presents itself in the form of carbuncle, it not unfrequently terminates in *gangrene*. This disease, which is usually located in parts remote from the centre of the circulation, is characterized by a soft, doughy, undefined swelling, with deep-seated, burning pain, an oppressive sense of weight, and vesication of the cuticle. In a short period, the swelling assumes a dark, brownish, violet or purple color, and imparts a peculiar, boggy feeling, as if the subjacent textures were floating in a fluid. Numerous apertures now appear in different parts of the skin, giving vent to a thin, acrid sanies. If the cellular substance thus affected be examined after death, it will be found to have very much the appearance of wet tow, being of a deep ash-color, soft, inelastic, extensively detached, and bathed in a bloody and offensive fluid. These changes are not always confined to the subcutaneous cellular tissue, in which they more commonly commence. Not unfrequently, long, sinuous tracks are formed between the muscles, and gangrenous shreds are seen hanging from aponeurotic sheaths, tendons, ligaments, and bloodvessels. Sometimes, though rarely, the disorganizing process extends to the periosteum, involving both it and the subjacent bone in the destruction. Excessive pain and great constitutional disturbance—at first of an inflammatory, and afterwards of a typhoid character—are the usual attendants of this formidable malady.

2. In *chronic inflammation*, the cellular tissue no longer tears with the same facility as in health; it is dense, hard, and crisp; admits of little extension, and is nearly destitute of elasticity. When the disease is protracted, the tissue gradually assumes an opaque, milky color, and its cavities are distended with sero-fibrinous matter, so as to be no longer permeable to blood, air, pus, or water. These alterations, which give the seat of the disease a tumid and constricted feature, are well characterized in the callous edges of old ulcers, in chronic erysipelas, in the hard swellings so often witnessed in gouty and rheumatic affections, in pelagra, elephantiasis, and in the induration of the cellular substance of new-born infants.

This disease seldom produces healthy pus; on the contrary, the matter is commonly of a sanious, sero-purulent, or sanguinolent nature. Occasionally small abscesses are scattered through the affected tissue, containing a yellowish, turbid serum, or thick curdy matter, not unlike that of a strumous lymphatic ganglion. In the subcutaneous cellular substance, these deposits are often inclosed by a thick layer of lymph, by which their contents are kept within their proper sphere. During the development of this sac, the circumjacent tissue is red and indurated; but, as soon as the membrane is organized, as often happens when the irritation is protracted, these phenomena generally disappear, and the parts gradually resume their normal properties. The sac often acquires great thickness and density, layer after layer being deposited upon its internal surface, as is the case with the adventitious membranes in other situations, when they participate in the inflammation of the surrounding structures. This affection is rarely attended with much pain; indeed, were it not for the hardened and inflexible state of the affected part, the patient would experience but little inconvenience.

3. *Induration* of the cellular tissue constitutes a peculiar disease in children, described by writers under the several appellations of œdematous hardening, scleroma, and skin-bound. It is comparatively rare in this country and in Great Britain; but, on the continent of Europe, especially in the foundling hospitals of Paris, it is extremely prevalent and fatal, hundreds of infants dying from it annually. Many children, it would seem, come into the world with this affection, or are attacked within the first twenty-four hours after birth. Its progress is usually very rapid, most of the little patients being cut off in the course of three or four days.

The disorder sometimes affects the whole body; more commonly, however, it is restricted to particular regions, as the abdomen and inferior extremities. The skin is of a brownish color, interspersed with yellowish looking patches, and its texture is remarkably hard and firm, almost like leather. The subcutaneous cellular tissue is very dense and granular, communicating, when cut, the sensation of fibro-cartilage, calf's-foot jelly, or half-dissolved glue. Frequently it is of a bright lemon-color, and contains a large number of dark yellow granules, which are nothing but diseased adipose vesicles. The infiltrated matter is sometimes firm and concrete; but, in the early stages

f the disorder it is commonly thin, and straw-colored, like serum,
nd readily coagulates by heat, alcohol, or dilute acid. The greatest
nduration is usually met with on the outer surface of the leg, and on
he dorsal aspect of the hand and foot.

Associated with these morbid appearances are various lesions of
he internal organs. The lungs are hard, increpitous, marbled, and
ongested; the oval foramen and arterial duct often remain patulous,
r are but partially closed; the liver is extremely vascular, and the
all-bladder is distended with vitiated bile; the mesenteric glands are
nlarged and injected; the gastro-enteric mucous lining is more or less
nflamed; and the whole venous system is remarkably engorged with
lood. Various opinions have been suggested respecting the precise
ature of this affection: the most plausible being that which ascribes
to inflammatory irritation, either of an acute or chronic character,
hich determines an effusion of sero-fibrinous matter into the meshes
f the cellular tissue, closing up its cavities and hardening its texture.

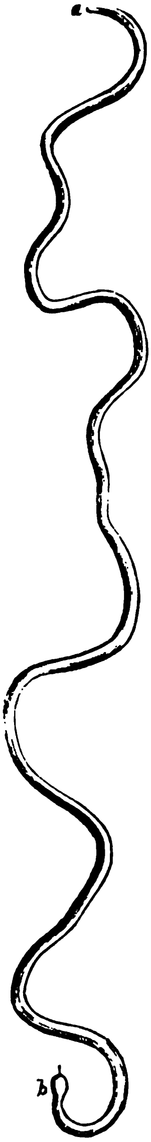
4. The cellular tissue is liable to various *morbid growths*, deposits,
nd transformations. Amongst these the most common are cysts,
elanosis, and fungus hæmatodes, neither of which will require par-
cular notice in this place. Fibrous, cartilaginous, and bony forma-
ons are most prone to occur in the sub-serous cellular tissue of the
hest, abdomen, and scrotum, in small grains, patches, or irregular
ncrustations. Such degenerations are extremely rare in the cellular
issue under the skin, and still more, if possible, in that of the mucous
nembranes.

5. *Serous infiltrations* of the cellular tissue are very common in per-
ons of deteriorated constitution, and in those who have become
xhausted by protracted diseases, profuse hemorrhages, and other
ffections impairing the vital powers. In poisoned wounds, the effu-
ion is generally very rapid, large in quantity, and highly acrid in
uality. Various terms have been employed to designate this con-
ition of the cellular tissue. Thus, when it is restricted to a particular
egion, as, for instance, the eyelid, leg, or scrotum, it is named *œdema;*
whilst, when it is more extensive, or diffused over the greater part of
the body, it is called *anasarca.* Neither of these appellations, it is
obvious, is well chosen, as the one literally signifies merely a swelling,
the other dropsy of the flesh. The interstices of the cellular tissue in
this disorder are very much enlarged, and the skin over the part,
which has generally a singularly glossy and tumid appearance, readily
pits upon pressure. The effused fluid, which is of a sero-albuminous
nature, is coagulable by heat, alcohol, and acids, and occasionally un-
dergoes spontaneous concretion. These serous infiltrations, in what-
ever part of the body they occur, ought to be regarded as the result of
apillary congestion, depending upon inflammation, debility, or me-
hanical obstruction.

6. *Hemorrhage* always arises from a rupture of the bloodvessels,
produced by external violence, or by some internal cause, the precise
ature of which is not so well understood. In the former case, the
luid, although sometimes widely diffused, generally forms an elastic,

circumscribed tumor, technically denominated an *ecchymosis*; in the latter, it is more commonly seen in small patches of a dark purple color, which have received the name of *suggillations*, death-marks, or cadaveric lividities. These spots, which are always most conspicuous on the posterior parts of the body, are very distinct in persons who die from petechial fevers, the plague, and the scurvy, and can be readily distinguished from ecchymoses by the entire absence of all signs of violence. Suggillations, however, do not always arise exclusively in the manner here indicated. In many instances, if not in most, they result entirely from an accumulation of blood in the capillary vessels of the skin and cellular tissue, without any extravasation whatever. These facts should be borne in mind, as they have a most important bearing upon legal medicine. For the want of correct information upon this subject, errors the most serious have sometimes been committed by physicians.

Fig 52.



a. Head; b Caudal extremity.

7. *Emphysema* may be produced by a great variety of causes, but the most common are penetrating wounds of the chest and rupture of the air-cells of the lungs, from violent coughing, or ulceration, and injury of the lining membrane of the windpipe. It has been supposed that it sometimes arises spontaneously, as the result of a process of secretion from the bloodvessels: and, in a considerable number of cases, it has been met with as an attendant on gangrene. The infiltration is sometimes very great, the air occupying nearly the whole of the cellular tissue. The distended parts have a bloated aspect, pit under the finger, and emit, when pressed, a peculiar crepitating sound, not unlike the lungs.

8. *Foreign substances* are sometimes found in the cellular tissue. In most cases they excite inflammation in the contiguous parts, and are finally discharged by suppuration. Not unfrequently, however, especially when they get admission through the alimentary tube, they become encysted, the cellular tissue around them being condensed, and converted into a sac. At other times, again, after traversing the body in different directions, they are arrested, and work their way out through the skin, generally at the back of the hand and foot, though in this respect there is no invariable rule. It is thus that bullets and needles often pervade the subcutaneous cellular tissue, starting, perhaps, at the trunk, and gradually reaching the most distant parts of the extremities, and this, too, frequently without producing any serious mischief. Not long ago, a case occurred in one of the Parisian hospitals, where the cellular substance was literally loaded with needles, and yet the patient lived several years in tolerable comfort.

9. The cellular tissue is occasionally the residence of *parasitic animals*, developed either in its substance, or introduced from without. Of these, the only one requiring notice is the *Filaria medinensis* (Fig. 52), the little dragon, or Guinea-worm. This animal, which is extremely simple in its structure, generally occurs immediately beneath the skin. The legs and feet are the parts which it more commonly infests, but it has also been observed in the scrotum, the anus, and in different parts of the head and trunk. It is of a white color, about the thickness of a violin-string, and, when full-grown, from five to ten inches in length; its diameter being nearly equal from one end to the other, except towards the tail, which is somewhat tapering and curled. The countries in which these worms most frequently occur, are Egypt, Arabia, Guinea, Persia, and Abyssinia. Several of them have been known to coexist in the same patient; and occasionally they have been found from three to four feet in length.

---

# CHAPTER III.

## ADIPOSE TEXTURE.

**Lesions of the Adipose Tissue.—Wounds.—Liability to Inflammation.—Hypertrophy, genera and local.—Adipose Diathesis.—Atrophy.**

WOUNDS of the adipose tissue present nothing unusual in their mode of healing: they commonly unite without difficulty, in fact, not unfrequently by the first intention. When the divided parts are kept asunder, the fatty matter is gradually absorbed, and the restoration is finally effected by the granulating process, as in similar injuries of other textures.

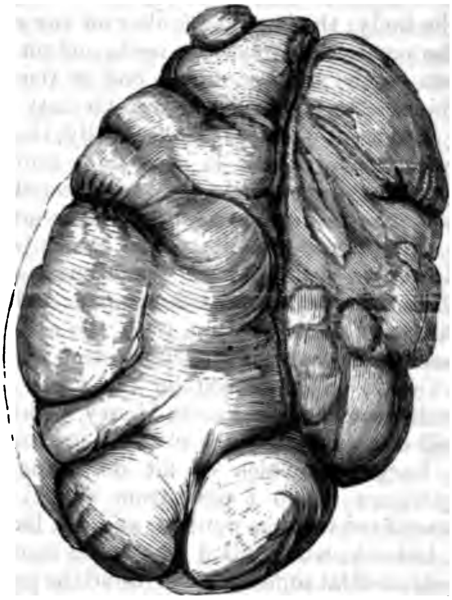
It has been questioned by some, whether the adipose tissue is susceptible of *inflammation*, the opinion having probably arisen from a belief, at one time very current among physiologists, that this substance is not endowed with a sufficient degree of vitality for this process to take place. In endeavoring to solve this problem, we must bear in mind the distinction between the adipose tissue, properly so called, and the fat. The one, as is well known, is an organized substance, provided with bloodvessels, nerves, and absorbents, and, therefore, liable to inflammation; the other, on the contrary, is inorganic, and on this account is insusceptible of any morbid action whatever. In acute inflammation, the adipose tissue assumes a dark reddish aspect, and always manifests a peculiar tendency to slough, in consequence, it would seem, of its vascular and nervous endowments being too feeble to offer the necessary resistance. In peritonitis, we often see the fatty omentum inflamed in one part, and gangrenous in another, even where there is little effusion of lymph or serum.

The adipose tissue is liable to *hypertrophy*. This may be general or partial. Various attempts have been made to estimate the standard amount of fat; but, as the quantity varies in different individuals, and even in the same person, under different circumstances of health and disease, it is obvious that there must be great difficulty in arriving at a satisfactory conclusion. The majority of anatomists, however, agree in the opinion that, in an adult of ordinary size, it forms about one-twentieth part of the entire body. Thus, a man weighing one hundred and sixty pounds, would have about eight pounds of fat. But, in case of obesity, it often greatly exceeds this quantity; and, on the other hand, in emaciation it often falls far below it. In general hypertrophy, the quantity of fat is sometimes enormous, amounting to five or six times the weight of the entire body. The celebrated Pritchard, of Kentucky, who exhibited himself at Litton's museum, in Cincinnati, in 1834, weighed five hundred and fifty pounds. The Canadian giant, as he was called, whom I saw in this city, in 1829, weighed six hundred and eighteen pounds. He was six feet four inches in height, and the circumference of each leg, around the calf, was nearly three feet. The most remarkable feature in the case was, that this enormous deposit of fat, making him so much larger than ordinary men of the same stature, was confined chiefly to the abdomen and lower extremities, the thorax, shoulders and arms being little stouter than in other persons. Daniel Lambert, of England, who died at the age of forty, weighed seven hundred and thirty-nine pounds; and a German journal relates the case of a man who weighed eight hundred pounds, the fat of the abdomen being nearly fourteen inches thick. An account of a somewhat similar case has been published by Dupuytren. The individual, a poor beggar-woman, measured five feet one inch in height, and five feet two inches in circumference. The thoracic and abdominal cavities were enormously loaded with adeps: on the mammæ, the subcutaneous layer was seven inches in thickness. But the most extraordinary example of this affection, of which I have any knowledge, occurred some years ago in the State of New York in a girl who weighed three hundred and sixty-four pounds, though only ten years and a half old.

There would thus seem to be, from the above detail of cases, sometimes a real adipose diathesis, nearly all the materials entering the circulating mass being converted into fat. Various articles of food and drink have a tendency to bring about this state of the system. Malt liquors, taken to excess, and the moderate use of wine and ardent spirits, are, perhaps, the most powerful means for producing general hypertrophy of the adipose tissue. But, whatever may be the exciting causes of these depositions, it is certain that indolence and freedom from care are necessary, if not essential, to the process. Castration is generally followed by considerable obesity; and the same thing has long been observed in women who have been deprived of the ovaries, or in whom these organs are diseased or imperfectly developed. Similar phenomena have been noticed in animals, after the removal of the spleen; though the obesity, in these cases, is generally only temporary, the body gradually returning to its former weight and spareness. Whether the same changes have ever been witnessed in the human bject, as the result of the loss of this organ, has not been ascertained. birds, considerable accumulations of fat sometimes occur in a very ort time. Thus, when the ound is loaded with insects d other nutritious subances, robins and thrushes ill occasionally fatten to ch an extent, in the course twenty-four hours, as to almost unable to get out the way of the sportsman.

*Partial hypertrophy* of this xture is well exemplified *adipose tumors.* (Fig. 53.) enerally developed under e skin, these tumors not nfrequently occur within e abdominal cavity, in onnection with the peritoeum. Their size, though ommonly small, is someimes enormous. Dr. Bray, f Evansville, Indiana, reoved one, some years go, weighing nearly forty pounds.

Fig. 53.



Fatty tumor. From a preparation in my cabinet.

In their shape, these tumors re usually somewhat globular, but as their bulk augments they are pt to become elongated, and to assume a pyriform, gourd-like, or pediculated configuration. Their surface is irregularly lobulated, and they are composed of various sized masses, of a rounded, or ovoidal shape, in all respects similar to those of the adipose tissue in the normal state. They are surrounded by a thin but firm capsule of cellular substance; and their supply of blood is by no means so liberal as might be supposed from their size, and the rapidity of their growth. These tumors sometimes occur in considerable numbers in the same individual. In a gentleman, thirty-eight years of age, who attended my lectures in 1844, I counted upwards of two hundred, from the volume of a small pea up to that of a large marble; they had a doughy, inelastic feel, and were nearly all of a globular shape. They were seated principally on the forearms, the inside of the thighs, the loin, abdomen, and pectoral muscles, the latter of which were liteally covered with them. None existed on the head, neck, and upper art of the back. They were first noticed in 1828; the general health as good, and no cause could be assigned for their occurrence. Durng two severe attacks of acute disease, attended with great emaciaion, many of them entirely disappeared. To ascertain the true chaacter of these tumors, I was permitted to remove one, about the size f a filbert, and found it to be composed entirely of fatty matter.

Sometimes, again, these fatty tumors betray an hereditary tendency.

In a case recently communicated to me by Dr. Charles Maer, of Tamaqua, Pennsylvania, the disposition has evinced itself in three successive generations. The grandfather had two fatty tumors on the back of the neck. Five of his sons have similar tumors on various parts of the body; the largest number on any one of them being eight, three on the posterior part of the neck, one on the right arm, one on the chest, one on the right shoulder, one on the left groin, and one on the right thigh. A grand-daughter has a fatty tumor on the side of her neck.

The adipose tumor occasionally, though rarely, inflames and suppurates. The matter is of a thin, sanious character, and mixed with globules of fat. It is seldom collected into a distinct abscess. In my private collection is a fatty tumor containing a deposit of bony matter.

In abdominal obesity, the encumbered organs are often literally buried in beds of fat. The tumors are generally more pediculated than those which are developed under the skin, and they may grow either on the omentum, from the epiploic appendages, or beneath the peritoneum, giving that projecting rotundity to the abdomen which is vulgarly distinguished by the name of "pot-belly," and which is so well described by Prince Henry, in his address to Falstaff, as "a huge hill of flesh," "a globe of sinful continents."

Large quantities of fat occasionally envelop the kidney. In a specimen which I took from an old man a few years ago, the mass amounted to three pounds; and Dr. Horner refers to one, removed from a bullock, which filled a common sized wash-tub. In the chest large masses of fat sometimes surround the pericardium, compressing the heart and great vessels, and thus inducing palpitation, and even fatal syncope.

*Atrophy* of the adipose tissue, which is far more common than its preternatural accumulation, may arise from one or other of the following causes: defective or unwholesome diet; organic lesions of the lungs, heart, stomach, or bowels; protracted abstinence, as in fasting, sickness, and the periodical sleep of hibernating animals; excessive loss of blood; immoderate indulgence in ardent spirits; long watching; exposure to intense heat; severe study, and great bodily fatigue. The latter is well exemplified in the case of grooms, and in persons who make long journeys on horseback. Captain Riley, of Ohio, who was shipwrecked on the coast of Africa, and captured by the natives, was reduced from two hundred and forty to ninety-two pounds, from excessive exercise, partly on an old camel, partly on foot, across the sandy desert. There seems to be sometimes a great diminution of this substance without our being able to assign any satisfactory cause; as, for example, in the case of the celebrated Calvin Edson, who, although apparently in good health, was literally nothing but skin and bone, his entire weight not exceeding fifty-eight pounds.

Men of anxious mind and fretful temper seldom get fat. With what justice does Shakspeare, in one of his most magnificent plays, make Cæsar say—

"Let me have men about me that are fat;
Sleek-headed men, and such as sleep o'nights.
Yond' Cassius has a lean and hungry look:
He thinks too much; such men are dangerous."[1]

---

[1] Julius Cæsar, act i., scene 2.

The removal of the fat, by whatever cause induced, is probably ected by the conjoined agency of the vessels and lymphatics; but on this subject physiologists are by no means agreed, some ascribing exclusively to the former, others to the latter, of these vessels. It uld be interesting to know in what form this substance is absorbed, ether as oily matter, or after undergoing chemical decomposition. cts are not wanting in support of both these views; but it must be nfessed, that, whilst the one is plausible, the other is much more in ordance with the laws and operations of the living system. The ipose vesicles, in this affection, diminish in size; and, as their walls e brought in apposition, an erroneous opinion has hence arisen that ey are sometimes entirely obliterated.

The adipose tissue is occasionally the seat of *melanosis*, occurring her in minute inky spots, or in small, spherical tubercles, of a conete or semi-fluid consistence. Most commonly it is seen in the fat the orbit, the anus and rectum, in the mesentery and omentum, and ound the kidneys. It has also been noticed in the subcutaneous leps, but much less frequently than in the other situations.

*Fatty transformations* are not uncommon. How they are produced, still a problem. It is not unlikely, however, that they are partly, not mainly, the result of a tardy inflammatory action, causing a erversion of the nutritive function, by which fatty particles are deosited in place of the healthy tissues, and the nitrogenous basis of hese converted into oil. These changes, which have hitherto been noticed chiefly in the heart, liver, and voluntary muscles, will be described in their appropriate places.

# CHAPTER IV.

## MUSCULAR SYSTEM.

I. *Muscles.*—Reunite when divided.—Inflammation.—Suppuration.—Mortification.—Chronic Irritation.—Softening.—Induration.—Ossification.—Fibrous and Fatty Transformations.—Heterologous Deposits.—Hypertrophy.—Atrophy.—Parasitic Animals.—Sanguineous Effusions.—II. *Tendons.*—Reunite when divided.—Inflammation.—Ossification.—Atrophy.—Diseases of the Sheaths of the Tendons.—III. *Aponeuroses.*—Acute and Chronic Inflammation.—IV. *Synovial Bursæ.*—Diseases.—Fibro-cartilaginous Concretions.—Hypertrophy.—Hydatoid Bodies.

## SECTION I.

### MUSCLES.

THE voluntary muscles *unite*, when divided by adhesive inflammation, with nearly the same facility as the cutaneous and cellular textures, the period required for the reparation varying according to the extent of the injury and the nature of the constitution. If the edges of the wound be allowed to remain apart, the restoration is effected through the medium of granulations, the growth of which is often rapid and luxuriant. As the healing advances, these bodies contract in volume, and are ultimately converted, by a modelling process, into real muscular tissue, or, at all events, into a substance so closely resembling it as to render it difficult to distinguish them from each other. I cannot understand upon what grounds the partial regeneration of the muscular tissue has been denied. That the bond of union is occasionally of a fibrous, ligamentous, or even a fibro-cartilaginous character, as has been contended, cannot be doubted; but that such is not the course which nature generally pursues, even in old persons, observation fully convinces me.

The principal lesions of the voluntary muscles are inflammation, change of consistence, ossification, atrophy, and the fatty transformation.

*Inflammation* of the muscles is by no means so common as in some of the other textures. It is not improbable that it sometimes commences in their own substance; much more frequently, however, it is communicated to them from the contiguous parts, as the intervening cellular structure and their aponeurotic coverings. The disease here, as elsewhere, may be acute, as when it is caused by wounds or external injury, or chronic, as when it is associated with gout and rheumatism. In either case, it is generally limited to particular muscles; though, in a few rare instances, it affects a whole group, either simultaneously or successively. As comparatively few opportunities have occurred for studying this lesion, it is not surprising that a good account of its anatomical characters should still be a desideratum.

The initial step in the acute form of the disease, as well, perhaps, as in the chronic, consists in an engorged state of the vessels of the connecting cellular texture, which, in consequence, loses its natural whiteness, and assumes a faint red complexion. The fleshy fibres are at the same time increased in density, though as yet they have experienced no change of color. Gradually, however, their vascularity is augmented, the affected part becomes rigid, and their contractile power is so much impaired that motion is not only difficult but painful, the muscle, the subject of the disease, being the seat of constant spasmodic actions.

At a more advanced period, when the disease has reached a higher grade of intensity, the connecting cellular tissue is swollen, and infiltrated with serosity, intermixed with globules and shreds of lymph. The muscular fibres are of a deep mahogany hue, soft, flaccid, easily torn, and scarcely distinguishable from the surrounding parts. The discoloration, although sometimes uniform, and diffused over a large extent of surface, more commonly occurs in irregular patches, with intervals of sound substance. In violent cases, it is not unusual to find small ecchymoses, caused by the rupture of some of the capillary vessels. The muscle, at this advanced stage, is totally changed in its character, and there is generally more or less effusion of serum, lymph, and blood, between it and the circumjacent structures, with inflammatory appearances of its aponeurotic sheath. The ordinary stimulants o longer exert their accustomed influence, the fleshy fibres remaining gidly fixed, even under galvanism.

It is seldom that inflammation of the muscles passes into *suppura- on.* The occurrence is most frequently witnessed in erysipelas, car- uncle, pyæmia, and other violent forms of inflammation, running ıpidly through their different stages. The pus, which is usually of fibrous character, is originally deposited in small disseminated glo- ules, which give the affected part a singularly speckled appearance. n rare instances it is collected into distinct abscesses.

Not less rare is *mortification* of the external muscles. This termi- ation has hitherto been observed chiefly in erysipelatous and carbun- ular inflammation, in old worn-out subjects. It is easily recognized y the altered color of the fleshy fibres, which are usually of a dark, ineritious aspect, by their softness and lacerability, and by their angrenous odor. The sloughs are detached in ragged shreds, bathed y a thin, dirty, sanious, and offensive fluid. The injured muscle is ever entirely regenerated; and the sphacelus, if extensive, generally roves fatal.

In *chronic inflammation*, the muscular tissue loses its florid complexion, nd assumes a pale yellowish appearance, not unlike that of an autumnal eaf. Its consistence is also increased; and the fleshy fibres, which are ften very much thickened, are so firmly glued to each other as to ender it difficult to separate them. This form of myositis, as before ntimated, occasionally terminates in suppuration. Another effect, which is still more rare, is *ulceration*. This is sometimes observed in hagedenic sores of the leg, extending successively through the skin, ellular substance, aponeurosis, and, finally, the muscular texture. The most remarkable circumstance about these erosions is the disappearance of the fleshy fibres. When the constitution is good, the restorative process generally goes on kindly, and the ulcer is soon filled with healthy granulations.

The muscles are occasionally in a state of *softening*. The loss of cohesion is generally limited to particular muscles, or even to particular portions. The exciting causes of the affection are still involved in obscurity; though it is not impossible that it mainly depends upon irritation and loss of nervous power. In proof of the correctness of this view, it may be stated that the lesion is usually connected with inflammatory appearances of the collateral tissues, or with general or partial paralysis. A flaccid condition of the muscular system often coexists with what is termed the tubercular cachexy, and with a watery and impoverished state of the blood. By whatever cause it is induced, the fleshy fibres are unusually pale, bordering on a light fawn tint, flabby, and easily lacerated, the slightest pressure being sufficient to convert them into a soft, pulpy mass. It is highly probable that most of the muscles thus affected are in a state of fatty degeneration.

*Induration* of the muscular tissue, arising from an effusion of plastic matter into the interstitial cellular substance, is frequently seen in the neighborhood of fractured bones, around scirrhous tumors, and in the legs of persons affected with elephantiasis, gout, and rheumatism. Under the influence of these causes, the muscular fibres are rendered hard and firm, and, in some instances, almost cartilaginous. The color, in the early stage, is simply brown; subsequently it acquires a pale reddish tint, and at a still later period the part exhibits a grayish leaden aspect, with here and there a spot retaining a portion of its natural complexion.

It has been doubted, even by high authority, whether the muscular texture is ever the seat of *ossification*. I am myself inclined to think that the primitive locality of the deposit is the interstitial cellular substance, whence it gradually extends to the fleshy fibres, blanching and extenuating them, or even wholly destroying them by absorption. This degeneration, though commonly confined to individual muscles, as those of the loins, shoulder, and calf of the leg, occasionally affects a great number of them. A striking example, in which the muscular system exhibited the ossific diathesis, is recorded by Dr. David L. Rogers, of New York. The subject was a boy, aged thirteen years, whose health had always been good until about six months before his death. The sterno-cleido-mastoid, great and small pectoral, trapezius, rhomboid, subscapular, broad and long dorsal, together with the muscles about the great trochanter, were all transformed, either partially or wholly, into bony layers. The scapula was fixed to the ribs and studded with bony excrescences. The great and small pectoral muscles were united into one, and attached to the ribs by osseous matter. The tendinous parts of the muscles were free from disease, and there was no ossification of the vascular system. In several situations spicules of bone, from one to two inches long, projected from the affected muscles. The mesenteric glands were increased in size, and a large abscess existed on each side of the chest. The abdominal and thoracic organs appeared to be healthy.

Ossification of particular muscles is sometimes witnessed as an effect of long-continued pressure. In recruits, the deltoid and pectoral muscles of the left side occasionally experience this transformation in a considerable degree, from the irritation produced by carrying the musket. A small, red, painful swelling is formed, which, if neglected, terminates in a mass of bone, from four to seven inches in length, and from two drachms to upwards of an ounce in weight.

This ossific tendency is occasionally exhibited in early life, and constitutes a very serious disease, in which not only the muscles, but also the ligaments and tendons are implicated.

In gouty and rickety subjects, whitish stone-like *concretions* are occasionally found in the muscles: they are usually of a spherical shape, with a volume seldom exceeding that of a pea, and consist principally of phosphate and carbonate of lime, cemented together by a minute quantity of animal matter.

The muscular tissue is occasionally transformed into the *fibrous*. The degeneration sometimes involves whole muscles, which, when the change is completed, scarcely retain a single vestige of their original features, save their shape, and even this is often materially altered. The deltoid and sterno-mastoid appear to be more frequently affected in this way than any other parts of the muscular system. The cause of this transformation admits of easy explanation. Whenever a muscle s placed in a state of total inactivity, it experiences a modification of nutrition, by which, without any appreciable irritation, it gradually oses its fleshy character, and is converted into a fibrous substance, the economy making an effort to rid itself of it, as a useless structure. This view derives confirmation from what occurs in the inferior animals. In some species of quadrupeds, for example, parts that are distinctly muscular in early life, are subsequently, by some change in the function of nutrition, transformed into another texture, better adapted to the wants of the system than one which is simply contractile.

Another lesion to which the muscles, in common with several other organs, are liable, is the *fatty degeneration.* In this affection the muscles generally retain their original form and volume, though in some instances they are partially shrivelled and disfigured. They are of a pale straw color, or even entirely white, unctuous to the touch, and rather diminished than increased in consistence. Notwithstanding this, however, the linear arrangement of their fibres is not only recognizable by the eye, but can be easily traced with the scalpel. On pressure, a clear oily fluid oozes out, which greases the finger, or whatever else is brought in contact with it, and is of an unusually inflammable nature. Muscular tissue, which has undergone the adipose degeneration, consists of an oily liquid, probably elaine, gelatine, adipocire, solid fat, and a substance resembling boiled flesh. These materials, the quantity of which is variable, are not deposited between the muscular filaments, as has been conjectured by some, but form actually a part of their component principles. Under the microscope, indeed, the whole fibre is seen filled with granules in part between the transverse striæ, in part replacing them. It is worthy of remark, however, that the interstitial cellular element is always considerably altered, being of a whitish color, very soft, and lacerable.

The fatty transformation is most marked in the muscles of the loins, hip, thigh, and leg of old persons affected with paralysis. It is likewise observed in the heart, and in some rare instances, in the muscles around unreduced luxations, large exostoses, and old deep-seated ulcers. When the change is complete and extensive, it occasionally involves the corresponding tendons and aponeuroses, which, in consequence, lose their polished, satin-like lustre.

It rarely happens that we have an opportunity of observing *tubercles* in the muscular tissue. When present, they are generally connected with a strumous diathesis, and coexist in other parts of the body. Otto states that he has several times seen tubercles in the muscles of the neck and thigh of scrofulous monkeys; Andral has noticed similar bodies in the muscles of the hog. In the case to which the latter writer refers, they occurred in association with small transparent hydatids, evidently of the cysticercic kind.

*Melanosis* is sometimes seen in the muscles in the form of an infiltration, which imparts its peculiar stain to the muscular fibres, converting them into a soft, pulpy substance, in which it is impossible to recognize the slightest trace of the primitive structure. Occasionally, again, the black matter is encysted, presenting an irregularly spherical mass, of pretty firm consistence, the volume of which varies from that of a pea to that of a fœtal head. This morbid formation is sometimes directly chargeable to external injury; at other times, it takes place without any assignable cause. It always betrays a malignant character, proceeding, if allowed to remain, to ulceration, and returning, sooner or later, when extirpated.

*Scirrhus*, *encephaloid* and *colloid* are also extremely infrequent. Indeed, so seldom do these heteroclite formations occur in the muscular system, that it has hitherto fallen to the lot of few pathological anatomists to observe them. In the interesting case of colloid described by the late Professor Warren, of Boston, an immense number of tumors of this kind, varying in size from that of a pea to that of a small granule, hardly visible without the aid of a microscope, existed in the voluntary muscles, especially in those of the thigh and abdomen.

It appears extremely doubtful whether any of the heterologous formations are, in reality, ever seated in the muscular substance itself. In all probability they are originally developed in the interstitial cellular tissue, whence, as they augment in volume, they encroach upon the fleshy fibres, which they displace, alter, or destroy. On this point, however, I am not prepared to give a positive opinion.

*Hypertrophy* of the voluntary muscles is extremely infrequent, and has hitherto been noticed chiefly in the tongue, where, as will be shown hereafter, it is occasionally congenital. As occurring from the influence of inordinate exercise, and the unusual influx of blood, the best example is that which takes place in the muscles of the arm of the blacksmith, and in the leg of the rope dancer. Muscles that have experienced this change, whether it be the result of accident, or purely physiological, are of a deep red color, firm, tough, and comparatively little compressible, with a bulk greatly exceeding what is observed in the normal state.

A more common affection is *atrophy*, or unnatural diminution of volume. It may arise either from general disease, such as phthisis, carcinoma, or dropsy, or from local difficulty, as inflammation, palsy, or defective nutrition. Indeed, whatever has a tendency to impair the function of innervation, retard the circulation of the blood, or produce permanent inactivity, may be considered as so many causes of atrophy of the voluntary muscles. Hence this lesion is generally associated with palsy, whether proceeding indirectly from disease of the cerebro-spinal axis, or directly from injury of the nerves supplying the affected part. The muscles around luxated joints, especially those of the hip and shoulder, are often atrophied, simply, it would appear, from want of exercise.

The extent to which the wasting of the muscles proceeds is various. Frequently they are reduced to mere membranous bands, pale, flaccid, and almost devoid of irritability; in some rare instances, their fibres are entirely absorbed, a dense cellular substance being all that is left in their place. In persons dying of protracted diseases, I have repeatedly observed a dark bluish color in particular muscles, especially those of the abdomen, accompanied with remarkable flaccidity and facility of laceration. These changes are very common in negroes; and, from having often noticed them within a few hours after death, I m disposed to think that they are not altogether cadaveric. Dropsical nd consumptive subjects, more frequently than any other, present hese appearances.

The voluntary muscles are occasionally infested by parasitic animals, the principal of which are the cysticercic hydatid, and the spiral richina. The former are seldom seen in the human subject, but are ery common in the swine, sheep, and ther quadrupeds, in which, particularly n the first, they often exist in immense umbers, rendering the flesh completely nfit for use. The *spiral trichina* (Figs. 4, 55, 56), discovered by Mr. Richard Owen, the distinguished English naturalist, is a very delicate, minute, coiled-up, ntozoon, about the twenty-fourth of a line in length, and the seven-hundredth part of an inch in diameter. It is of a cylindrical shape, and terminates obtusely at both extremities, which are of unequal size, the larger being furnished with a transverse linear orifice, which evidently answers the purpose of a mouth. The alimentary canal, as described by Dr. Farre,[1] is bounded by two slightly irregular lines running parallel to each other, for the distance of rather more than one-fifth of the length of the body, where they terminate in a transverse ridge, presenting a minute concavity towards the large extremity. From this point on, the canal exhibits a sacculated arrangement, the little dilatation appearing as if bound down by a line extending along the surface of the tube in the direction of its axis. This sacculated appearance is gradually lost towards the smaller end, where the part assumes a zigzag or spiral course, and terminates in a small slit, regarded as the anus. No nervous system has been discovered. In the female Dr. Farre has pointed out a collection of ten or twelve granules, about one-fifth of the length of the body from the blunt extremity, which he considers as the ovary.

Fig. 54.

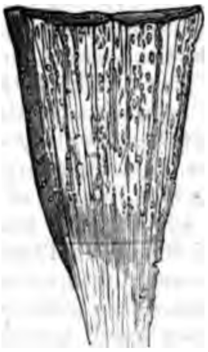


Fig. 55.

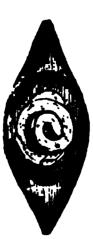
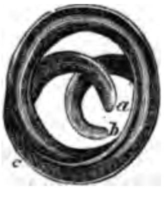


Fig. 54. Cysts of the spiral trichina *in situ*, natural size.

Fig. 55. Separate cyst, containing the trichina magnified.

It is a singular fact that this worm is always inclosed by a distinct cyst, which is the reason, probably, why it so long escaped the observation of anatomists; since its occurrence is rather frequent than otherwise. This cyst, which is supposed by some to be merely condensed cellular tissue, is formed out of the plastic lymph of the blood, and is scarcely one-fortieth by one hundredth of an inch in diameter. It is of a whitish appearance, and of an oblong shape, with one extremity so contracted as to form a short, imperfect neck.

Fig. 56.



The animal magnified: *a.* Head; *b.* Tail; *c.* Body.

Amongst a collection of trichinas, it is by no means uncommon to find some which have lost their vitality or been entirely removed by absorption. In such cases, the inclosing cyst is usually collapsed, more or less opaque, or even ossified, like that of a dead hydatid. It is probable that these parasitic animals enjoy but a very brief existence. The length of time that they retain their vitality after removal from the body of the patient in which they are found, is variable. Mr. Owen mentions the fact of life having been discovered two weeks after death. Generally there is only one animal in each cyst, but occasionally, though very rarely, two and even three have been found. The inclosing cyst lies parallel to the fleshy fibres, in the connecting cellular tissue of which it is developed. The trichina is almost wholly confined to the muscles and tendons of voluntary motion. It has also been met with in the little muscles of the ossicles of the ear, but it has never been seen in the substance of the heart or in the fleshy fibres of the alimentary canal. Their number is sometimes prodigious. Dr. Bowditch states that he has counted upwards of fifty in a superficies of a quarter of an inch square, and he supposes that the muscular system of a person of moderate stature might contain as many as 7,680,000. Their development seems to be uninfluenced by age, sex, constitution, or any particular form of disease, though they have hitherto been most frequently observed in chronic organic affections. They have, however, been seen in persons who were killed apparently in perfect health. Of their mode of origin, growth, and nourishment, nothing is known.

---

[1] Library of Practical Medicine, by Dr. Tweedie. Amer. edit.

Muscular *apoplexy* appears to be most common in scorbutic subjects, or in persons of a weak and lax fibre, with a thin and watery state of the blood. It has likewise been noticed in persons affected with intermittent fever, delirium tremens, and phlegmonous erysipelas. No muscles, not even the heart, are exempt from it, but the straight muscles of the abdomen are, perhaps, more frequently and extensively affected than any other. The number of apoplectic depôts is extremely variable. In some instances there are only a few, whilst in others there are several dozens. They are at first of a dark color and soft consistence, but they gradually become lighter and more solid, resembling, in these respects, apoplectic depôts of the brain. In volume, they range between a pea and a hen's egg. The muscular texture immediately around them is more or less lacerated, and infiltrated with blood.

## SECTION II.

### TENDONS.

THE extremities of a divided tendon readily unite through the intervention of lymph, which gradually assumes all the properties of the original texture. During the first few days, the matter is very soft, and of a red color, from the admixture of the blood poured out in the operation. By and by, it augments in density, becomes slightly plastic, and adheres more or less tenaciously, not only to the cut ends of the tendon, but likewise to its fibrous sheath, which is discolored for some distance from the wound. In a few weeks, the extravasated blood is entirely absorbed, and the new substance, now of a pale grayish complexion, is diminished in thickness, but increased in firmness, and inseparably coherent with the original structure, to the properties of which it ultimately assimilates itself. When these bodies are destroyed by gangrene, it is probable that they are never entirely regenerated.

From what is known concerning the organization of the tendons, it might be inferred that they are not very prone to *inflammation;* and such, indeed, experience has shown to be the fact. The disease, in most cases, arises spontaneously from the influence of the syphilitic poison, the operation of mercury, or from the effect of atmospheric vicissitudes. Its march, under these circumstances, is generally of a chronic nature, the most important alterations which it induces being hypertrophy and induration of the affected part. Conjoined with these changes are usually certain morbid appearances of the fibrous sheaths, such as infiltration of their external cellular texture with a greenish jelly-like fluid, thickening and opacity of the lining membrane, and effusion of yellow turbid synovia. Purulent matter is sometimes poured out; and the tendinous structure may be so much altered as to become unfit for its functions.

The process of acute inflammation is most distinctly seen in wounds, sprains, and whitlow. The tendon loses its natural polish, and assumes a faint reddish color, from the engorged state of its capillaries. At a more advanced stage, lymph is poured out, either alone, or mixed with serum and blood; in violent cases, suppuration occasionally sets in, but this is rare. When the inflammation has attained its height the tendon is of a pale ash color, soft, pulpy, and considerably thickened.

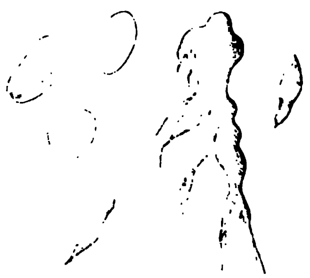
Inflammation readily deprives the tendons of their vitality; a circumstance which is not surprising when we consider their feeble and imperfect organization. Whole cords are sometimes destroyed by this disease, and ultimately cast off in the form of sloughs; the work of separation, however, is usually very tedious, and resembles a good deal the exfoliation of a necrosed bone. In this state, the tendons lose their pearly lustre, assume a dull grayish aspect, and become thick and doughy; the individual fibres, however, retaining, in some degree, their original consistence. This occurrence most frequently happens in the fingers and palms of the hand in what is called whitlow; one of the most painful and distressing affections to which these textures are liable.

*Ossification* of the tendons is much less common in man than in the inferior animals. Birds are very liable to it; it is also frequently observed in the horse, sheep, goat, and ox. The change is most common in the tendons of the foot in old subjects, where they slide over, and rub upon the bones.

*Atrophy* is likewise very rare, and is only observed in connection with great wasting of the muscular texture. Inordinate enlargement occurs principally as an effect of chronic inflammation. I am not aware that any of the heterologous deposits ever take place either in the tendons, or in any of the other structures included in the present chapter.

The sheaths of the tendons, like other serous structures, are subject to *dropsical accumulations.* The bags thus formed are generally of an ovoidal shape, and vary in size from that of a pea to that of an apricot. Their contents are usually of a glairy viscid character, like the white of eggs, though, in this respect, there is considerable diversity in different cases. Sometimes, along with the fluid, the sac contains a number of loose bodies, similar to the concretions found in the movable joints and synovial bursæ. They are of a pale yellowish color, tough consistence, shaped like gourd-seeds, and of variable size, from that of a grain of wheat to that of a bean.

Fig. 57.



Fibroid bodies of a ganglion. From a preparation in my collection.

This disease constitutes what, in surgical language, is called a *ganglion.* A difference of opinion has existed in regard to its nature, the question being, whether it is of new formation, or merely a sacculated expansion of the serous lining of the tubular structure in question. For my own part, I have no hesitation in saying that the former opinion is entirely gratuitous. The disease occurs most frequently at the wrist, along the extensor tendons. Females are more subject to it than males, especially such as are much engaged in hard manual exercise.

## SECTION III.

### APONEUROSES.

The aponeuroses, possessing the same organization as the periosteum, dura mater, and pericardium, are liable to the same diseases. *Acute inflammation* is very rare, and is observed principally as the result of external violence, whitlow, and anthrax. Gout and rheumatism are supposed to have their seat exclusively in the fibrous envelops of the extremities; but of the truth of this opinion many physicians still entertain serious doubt. My own idea is, that the aponeurotic, ligamentous, tendinous, and bursal textures are all implicated nearly in the same degree, the diseases here referred to sometimes beginning in one, sometimes in another, but sooner or later attacking the whole of them. Upon this subject, however, we stand in need of further and more substantial information.

In *chronic inflammation*, which is much more common than the acute, the aponeuroses become thickened, preternaturally hard, and of a pale yellowish hue, interspersed with grayish, leaden colored, or brownish patches. Spicules of bone sometimes sprout from them; they may acquire quite a large size, and exhibit the appearance of so many stalactites. Another effect of chronic irritation, likewise very rare, is extreme attenuation of these membranes, constituting real atrophy. This result is generally produced by the pressure of a tumor, which, exerting its detrimental influence for some time, by degrees causes the absorption of the aponeurotic fibres. Inflammation of these structures manifests little disposition to pass into suppuration, gangrene, or ulceration; and the heterologous deposits are almost entirely unknown in them.

## SECTION IV.

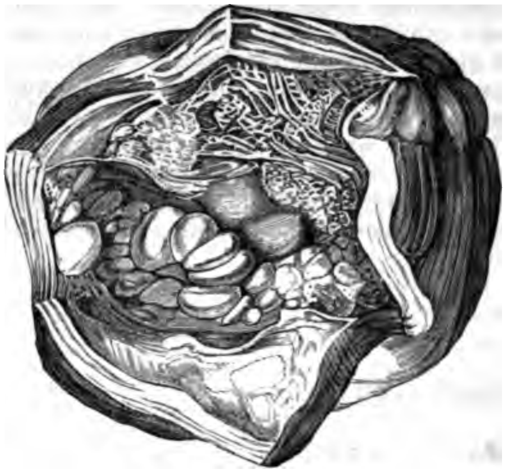
### SYNOVIAL BURSES.

The synovial burses are liable to inflammation, suppuration, thickening, and cartilaginous degeneration.

One of the earliest effects of acute inflammation is an increase of vascularity, the redness here, as in the other serous structures, appearing, at first, in separate lines, which at length coalesce, and thus assume an arborescent arrangement. In some instances, the redness has a dotted form, or there are small ecchymoses, caused by the rupture of some minute vessel. The synovial membrane loses its transparency, and presents an opaque, milky aspect, being as yet little or not at all thickened. When the disease is at its height, the natural secretion is partially suspended, which, however, lasts only for a short time, when it not only augments in quantity, but is likewise changed in quality. Instead of being thin, oily, and transparent, it takes on the appearance of a brownish, turbid serum, mixed with flakes of lymph, pus, or even small clots of blood. The tumor which is thus formed is sometimes as large as a cocoa-nut, but generally it does not exceed the size of a walnut, an orange, or a goose's egg: in most cases it is rounded, elastic, and painful on pressure, the skin covering it being red and hot. The fluid, whatever may be its nature, may open externally, or the sac may burst, and the fluid be effused into the surrounding cellular tissue. I have repeatedly found these tumors filled with a substance of the color and consistence of currant jelly.

When the disease is *chronic*, the effused fluid is sometimes loaded with loose concretions, of a dense semi-cartilaginous consistence. (Fig. 58.) They are of a light yellowish color, and of a flat oval form, not unlike melon-seeds. Their numbers are occasionally quite great, upwards of fifty having been extracted from a single burse. How are these bodies produced? It has been inferred that they are merely masses of plastic lymph originally poured out in soft amorphous flakes, which by degrees become firm, and assume a determinate shape by the pressure of the surrounding parts. This is one way of accounting for them; another is to suppose that they originally grow from the inner surface of the sac, from which they are at length detached by friction, like the little tumors sometimes met with in the movable joints.

Fig. 58.



Fibroid bodies of a synovial burse.

In protracted cases of this disease, the sac is very apt to become *hypertrophied* and indurated. It has been seen more than half an inch in thickness, with a small central cavity filled with synovial fluid. In the horse it is often converted into a hard gristly substance; and the same phenomenon is occasionally witnessed in the human subject. Cases occur where it partakes of an osseous character. Not unfrequently the inner surface of the sac exhibits a honeycomb appearance, the shreds of lymph intersecting each other in various directions. In many instances, however, though the inflammation may have persisted for a long time, the membrane retains nearly its primitive structure.

Bodies closely resembling *hydatids* are sometimes found in the synovial burses. In one case, upwards of one hundred and forty of these substances, varying from one to three lines in diameter, nearly transparent, and of a lenticular shape, were counted; they were situated in a large pouch between the great trochanter and the tendon of the great gluteal muscle.

---

# CHAPTER V.

## ARTERIES.

**Lesions.—Wounds.—Inflammation.—Suppuration.—Ulceration.—Gangrene.—Softening.—Induration.—Hypertrophy.—Morbid—Deposits.—Contraction.—Aneurism.**

The arteries are liable to wounds, inflammation, suppuration, ulceration, contraction, and dilatation, hypertrophy, and different morbid deposits.

1. *Wounds.*—When an artery is divided, the immediate effect is an
petuous flow of blood, attended by a forcible retraction of the vessel
hin its sheath, and a slight annular contraction of its extremity.
e canal of the sheath is now closed by the formation of a coagulum,
od being at the same time effused into the surrounding cellular
stance. The next step in the process is the concretion of the fluid
hin the divided vessel, generally as high up as the nearest collateral
nch. The stopper thus formed is commonly of a slender, conical
pe, with the apex directed towards the heart. It is seldom suffi-
ntly large to constitute a perfect plug for the vessel, nor does it at
t adhere very firmly to its internal surface, excepting at its base,
ere it is also closely united with the outer coagulum. The connec-
n between the two clots, and the relation which they sustain to the
fice of the divided artery, have been felicitously compared to the
uth of a bottle, closed by its stopper, and covered with sealing-wax.
Soon after these coagula have formed beneath, around, and within
divided artery, the different tunics, taking on inflammation, pour
plastic lymph, which serves still further to seal up the orifice of
vessel, and to strengthen the connection between it and the clotted
od. The absorbent vessels of the parts are also actively engaged
carrying away, at first, the more attenuated, and afterwards the more
id elements of the coagula in which these changes occur, until the
ole mass is finally transformed into a dense grayish cord, in which
s difficult to discern any trace of the original textures. The period
quired for the perfection of these changes varies in different cases,
pending upon the volume of the vessel, the nature of the wound,
d the constitution of the patient.

Such, in a few words, is the process employed by nature in arresting
morrhage from a divided artery. Similar phenomena, very nearly,
ke place when a vessel of this kind is tied with a ligature, except
at there is no external coagulum. The internal clot is also generally
ore complete; and, as the serous and fibrous membranes are usually
t through, the inflammation is apt to run much higher, the different
ats being often rendered extremely vascular and pulpy. The liga-
re is either removed by absorption, or, as is more frequently the
se, it remains until the outer tunic is destroyed by ulcerative action;
hich, when the artery is small, usually happens in eight or ten days,
ut, when large, not under several weeks. In whatever way an artery
e obliterated, the collateral vessels, as they are termed, are always
ermanently enlarged, compensating thereby for the lost power on the
art of the main trunk. Thus, by the anastomoses of the vascular
ystem, and by the happy contrivance here alluded to, the Creator has
rovided the means of carrying on the circulation, even after the
toutest branches are completely closed up.

When an artery is wounded longitudinally, or to a small extent
bliquely, either an aneurism is formed, or the breach is repaired by
dhesive inflammation. The same consequences follow when an artery
punctured with a sharp-pointed instrument, or if it be divided trans-
ersely through one-fourth of its circumference. If the vessel be cut
cross one-half or two-thirds, cicatrization will be impossible; the in-

jured tunics will either yield to their native power of retraction, or they will be destroyed by ulceration. In either case, the final restoration is effected in the same manner nearly as when the vessel is cut across in the first instance.

When an artery is forcibly lacerated, it is much less apt to bleed profusely than one that is divided by a transverse cut. Cases occur where whole limbs, involving, of course, the largest arteries, are torn from the body, and yet scarcely any blood is lost. The retraction and annular constriction are always much greater here, and the coagula also much larger, as well as more rapidly formed, than under opposite circumstances; and these occurrences, added to the ragged state of the inner and middle coats, and the exhausted condition of the patient, as must always happen in such severe accidents, afford a speedy and effectual barrier to the emission of blood.

2. *Acute Arteritis.*—Acute arteritis is generally induced by external injury, or by an extension of disease from the adjoining structures. Nevertheless, it occasionally exists as an idiopathic affection, or comes on without any assignable cause. Restricted in the majority of instances to one or more of the larger trunks, it not unfrequently involves the smaller branches, and sometimes even the capillaries. Occasionally the disease appears to pervade nearly the whole arterial system.

When arising spontaneously, the disease usually begins in the internal membrane and subserous cellular tissue, from which it gradually spreads to the other tunics; the reverse happening when it is induced by external violence. The anatomical characters of acute arteritis are redness, opacity, rugosity, and softening of the lining membrane, with an engorged, lacerable, and thickened state of the outer and middle tunics. When the inflammation is severe, the parietes of the affected artery are generally remarkably pulpy, and so much diminished in consistence as to be easily torn or divided by the ligature. The nutrient vessels are loaded with blood, and often exhibit a real varicose aspect, their ultimate twigs ending apparently in the subserous cellular substance. With regard to the redness of the internal membrane, it is liable to considerable diversity; generally speaking, it occurs in small patches, which are diffused over a considerable extent of surface, and which vary in diameter between that of a split pea and a five cent piece. In intensity it ranges from a light pink to a deep scarlet, through numerous intermediate shades of lilac and purple. In some instances the redness is uniform. With this change of color are always associated important alterations of texture. The inner membrane, as was before intimated, losing its smoothness and polish, assumes a rough, fleecy aspect, and, owing to the softened state of the subserous cellular tissue, is easily detached from its natural connections. Globules of lymph, either alone or blended with pus, occasionally adhere to its inner surface; and, in the larger arteries, it is not uncommon to meet with well developed pseudo-membranes, similar in all respects to those of the serous textures of the splanchnic cavities. The other tunics are also seriously affected. They become moist, tumid, friable, and transformed frequently into a reddish, homogeneous mass, almost devoid of cohesive power. Their elasticity, naturally so great, is partially lost, and in many instances they are freely infiltrated with serosity, sanguinolent fluid, or even pure pus.

Patches of a scarlet, purple, or brownish color, caused by the imbibition of blood, are sometimes observed on the inner coats of the arteries after death, and have been supposed, though erroneously, to be a result of inflammatory irritation. They are most conspicuous on the under surface of the vessels, or where there is the greatest amount of blood accumulated, and they are frequently witnessed in persons who die of pulmonary phthisis, putrid fever, apoplexy, and malignant cholera. The redness thus produced exhibits the appearance as if it were dyed into the very substance of the lining membrane, and it commonly exists in stripes, small specks, or geometrical figures, having an abrupt termination; that, on the other hand, which results from irritation generally loses itself by insensible degrees, nor is it diffused over so large an extent of surface. But, however this may be, no difficulty can possibly arise upon the subject, when it is remembered that the inflammatory discoloration is constantly associated with important lesions of the arterial tissues. The cadaveric redness always appears much sooner in warm than in cold weather, and may be produced at pleasure by steeping a vessel for twenty or thirty hours in fluid blood, at a moderate degree of heat.

3. *Suppuration.*—Although suppuration is seldom spoken of as an attendant on arteritis, yet I am inclined to believe that it is more frequent than is commonly imagined. The matter being generally effused upon the inner surface of the vessel, is swept away by the circulating current as fast as it is secreted, which is the reason, doubtless, why it is not oftener noticed after death. Sometimes, however, it is entangled in the substance of the false membranes, infiltrated into the arterial tunics, or collected into small points between the inner and middle tunics. Arteritis is much less liable to terminate in suppuration than phlebitis, in which respect the one resembles inflammation of the serous membranes, the other of the mucous.

4. *Gangrene.*—The arteries may be said to be almost insusceptible of gangrene. Their conservative energies, as stated elsewhere, are surprisingly great, and hence they often escape destruction in the midst of parts that are perfectly deprived of vitality. In such cases, their outer surface becomes incrusted, at an early period of the disease, with a thin layer of fibrin; and, long before the dead textures begin to separate, the blood coagulates in their interior, thus opposing an effectual barrier to the occurrence of hemorrhage.

5. *Ulceration.*—Ulceration, as a consequence of arteritis, whether acute or chronic, is seldom witnessed. Manifesting a peculiar predilection for the larger trunks, it commonly commences in the serous membrane, from which it gradually extends to the middle and outer tunics until it leads to complete perforation. Such a termination, however, is extremely rare. The ulcers, which are very irregular in respect to their form, vary much in their size, number, and general characters. At times they are very small, scarcely exceeding the diameter of a mustard-seed; but they may be as large as a split pea,

a five cent piece, or even a guinea, according to the size of the affected tube. Their margins are usually ragged, irregular, and considerably elevated, but seldom injected; their bottom, which is rough and uneven, is commonly formed by the middle tunic, the fibres of which frequently present a shreddy, lacerated appearance. In many instances, the erosions look like so many fissures, cracks, or chaps, with sharp, prominent, and irregular borders. This form of the disease is ordinarily dependent upon the presence of calcareous matter. The number of ulcers is seldom considerable, though in a few rare cases the inner surface of the larger trunks has been found completely checkered with them. When confined to the internal tunic, they sometimes admit of cicatrization.

6. *Softening.*—Softening of the arteries is a common occurrence, especially in the smaller branches. It is often witnessed in organic diseases of the principal viscera, and is a frequent attendant upon acute inflammation, cancerous affections, and the application of the ligature. In chronic enlargement of the liver and spleen, the arteries which supply these viscera are often so much changed in their structure that they can be torn, or their coats separated from each other, with the greatest ease. In puerperal fever, the arteries of the uterus are occasionally converted into soft, pulpy, friable, and inelastic cylinders, incapable of withstanding the slightest resistance; and similar phenomena are frequently witnessed in the cerebral arteries in mollescence of the brain and around apoplectic effusions. In the chronic form of the disease, the larger trunks are more commonly involved.

This disease is characterized, as the name indicates, by a diminution of the cohesive power of the vessel, the coats of which are rendered friable, spongy, and inelastic. When acute, it is generally accompanied with slight tumefaction, engorgement of the capillary vessels, and effusion of serosity or sanguinolent fluid into the interstitial cellular tissue. In the chronic form, however, the coats of the vessel retain their normal thickness, or they may even be diminished in size, and exhibit a dry, shrivelled appearance.

The degree of mollescence of the arteries varies from a slight diminution of the natural consistence of the part affected to that of a soft, pulpy, friable substance. In mild cases, or in the incipient stage of the disease, the morbid alteration is often so inconsiderable as to be altogether overlooked. At a subsequent period, however, or when the lesion is fully developed, the diminution of consistence is so great as to be recognized at first sight. The part affected has a tumid, infiltrated appearance, and is converted into a semi-pulpy, friable, and disorganized substance, which readily yields under the pressure of the finger or the handle of the scalpel. This degree of softening is chiefly witnessed in acute inflammation of the parenchymatous organs, attended with effusion of serum, lymph, pus, or other fluid. It also occurs in erysipelas and gangrene, as well as after the application of the ligature in persons whose constitution has been impaired by old age or the effects of disease. In the chronic form of the disease, the arterial tunics are rather friable than softened; there being no tumefaction, engorgement of the capillary vessels, or infiltration of ny kind. They are, in fact, affected with a sort of dry softening, ithout any other appreciable lesion. They are of the natural thickess, but so brittle that they are incapable of withstanding the slightest orce. This form of mollescence is principally observed in encephaoid disease, in osteo-sarcoma, in hypertrophy of the liver and spleen, n softening of the bones, and in chronic enlargement of the joints. In he first of these affections, it is evidently the cause of the frequent emorrhages of which it is the seat after the establishment of ulceraion.

The extent of the softening is extremely variable. It may be limited o a small portion, comprehend the whole circumference of the affected essel, or be diffused over a surface several inches in length. It may e confined to a single artery, or occur in a great number. It has een described as pervading nearly the whole of the arterial system, specially that portion of it which is conneccted with the left ventricle. inally, it may be limited to the individual tunics, or it may affect hem all at the same time. The disease, however, is most common in he internal and middle coats, or, rather, in the cellular tissue by which hese two layers are united to each other. In idiopathic softening he external tunic often escapes entirely, even when there is great oss of cohesion of the other layers.

The color of the softened part is also liable to vary. When the disase is the result of acute inflammation, as when it is caused by the pplication of a ligature, the most common discoloration is the red, hich is usually most conspicuous in the lining membrane, to which t may be entirely limited, or it may extend to the other tunics. The edness may be circumscribed or diffused, and vary in degree from a ight rose to lilac, scarlet, modena, or even purple. In the chronic orm of the affection, the softened part presents a pale yellowish, graysh, or dull whitish tint, its natural color being little altered; except, perhaps, in the middle tunic, which is sometimes of a brownish or dull mahogany hue.

Softening of the arteries is sometimes associated with the formation of fibrinous concretions in the interior of these vessels, with atheroma, and with the fibrous, cartilaginous, or osseous degeneration. It always impairs the elasticity of the coats of the affected vessel, diminishes their power of resistance, and predisposes to laceration, dilatation, aneurism, and even perforation.

7. *Chronic Arteritis.*—Chronic arteritis is probably a much more common affection than the great silence of the profession respecting it would lead us to infer. Like the acute form of the disorder, it is much more frequently observed in the large than in the small arteries, and hitherto has been noticed chiefly in persons who have died of lesion of the heart, or who have been constitutionally affected by mercury, syphilis, or scurvy. The most prominent feature of chronic inflammation is thickening of the several coats of the artery, which, in protracted cases, may amount to such a degree as to encroach materially upon its caliber. The nutrient vessels are not much injected, and the redness, so conspicuous in the acute variety of the disease, is rarely present in this. The lining membrane, on the contrary, is of a yel-

lowish, dusky, brownish, or grayish tint, interspersed frequently with bluish spots, which thus give it a mottled appearance. All the tunics are abnormally thickened, dense, and brittle, possessing little elasticity or cohesive power. The morbid process is supposed to commence on the outer coat and gradually to extend inwards. Patches of fibrin are often observed upon the inner surface of the vessel; and, in many instances, the lining membrane is considerably puckered, cracked, or even forced out of its natural situation. The various deposits presently to be noticed, are probably all caused by chronic inflammation.

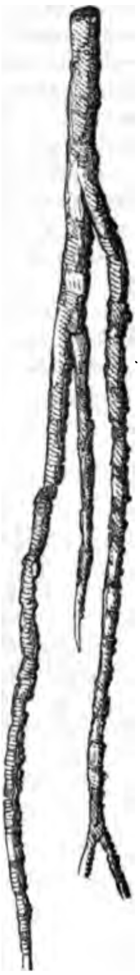
8. *Induration.*—Induration of the arteries, as a pure uncomplicated affection, is rare. It is usually associated with hypertrophy, or with the fibrous, cartilaginous, atheromatous, or osseous degeneration, and is most common in the aorta and its primitive branches. It is very rare in the arteries of the superior half of the body. Old age is the period of life most liable to this alteration, which may affect a single vessel, a considerable number, or even the whole of this division of the vascular system; it may involve all the tunics, or it may be limited to one or more of the individual membranes.

An artery, in a state of induration, is preternaturally fragile, devoid, in part, or entirely, of elasticity, and capable of withstanding an unusual degree of lateral pressure. The connecting cellular tissue is remarkably friable, and hence the different tunics may generally be easily peeled from each other. The color of the affected part varies in the different layers; in the serous, it is commonly pale yellowish, interspersed with grayish or reddish brown; in the middle, the more frequent tint is light mahogany, or pale maroon; while in the external there is rarely any perceptible alteration from the natural appearance. The lining membrane is often puckered, many of the nutrient vessels are obliterated, and, when the induration is combined with hypertrophy or some of the deposits about to be mentioned, the caliber of the affected tube may be sensibly diminished in size.

9. *Transformations.*—Occasionally we find deposits resembling *cartilage*, either alone, or, as is more generally the case, in association with calcareous or atheromatous matter. Most commonly they are limited to the inner membrane of the arteries, in the connecting cellular substance of which they appear to be developed in the form of irregular isolated patches, of a whitish, yellowish, or grayish aspect. Not unfrequently, however, they implicate all the tunics, occupying the vessel to such an extent as to convert it into a firm, inelastic tube. Writers are by no means agreed in regard to the question, whether this matter is originally deposited in a cartilaginous form, or simply in that of fibrin. The result of my own researches would lead me to adopt the former opinion.

The most common affection of the arteries, by far, is the deposition of *calcareous matter*. It is particularly frequent in old people, after the sixtieth year; but no period of life, except early infancy, is exempt from it. The arteries most commonly implicated are, according to my observations, the thoracic aorta, the femoral, popliteal, tibial and fibular, splenic, spermatic, iliac, cardiac, and radial. The deposit is very frequent in the cerebral arteries of old persons, and thus often lays the foundation of the apoplectic effusions so common at this period of life. The carotid, subclavian, brachial, hypogastric, hepatic, mesenteric, and gastric arteries are seldom ossified. In the pulmonary artery this degeneration is extremely rare. Instances occur where there seems to be a peculiar ossific diathesis, almost all the arteries in the body being rendered bony. Of this I witnessed an extraordinary example in 1834, in a man sixty-five years old, in whom not only the larger trunks, but all the muscular twigs, were transformed into rigid, inelastic cylinders, blunting the knife at every incision.

Fig. 59.



Deposition of calcareous matter. From a specimen in my collection.

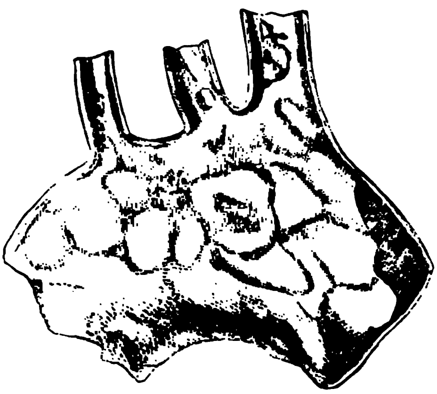
The calcareous matter exists in various forms; sometimes in small grains and nodules; sometimes in scales, plates, and patches; and sometimes in complete rings, which encircle the vessel, and convert it into a firm, inflexible tube, totally devoid of its normal attributes. These appearances are exhibited in Fig. 59. In the incipient stage of their development, these deposits often consist of minute isolated specks, of a light straw color; and not unfrequently they are associated with other secretions, especially the atheromatous and cartilaginous. In whatever form the matter shows itself, the coats of the arteries always experience important modifications, becoming preternaturally hard and brittle, and either thickened or attenuated. These changes are generally most conspicuous in the two inner membranes, which assume a dense, corrugated appearance, and are extremely liable to break and ulcerate, thus frequently obliging the outer tunic to sustain the whole force of the circulating torrent. The serous lining is often remarkably thick, dense, opaque, and transversely wrinkled.

Destitute of the usual structure of bone, the calcareous deposit differs still further from this texture in not possessing vitality, and in being always secreted in the form of a homogeneous mass, without any definite arrangement. The component elements of this substance vary in different specimens, even from the same individual; but, in most cases, the proportion of animal matter is small. In the experiments of Brande, one hundred parts were found to consist of sixty-five of phosphate of lime, and thirty-five of albumen, with some traces of gelatine; whereas in those of Vauquelin the animal matter formed only about one-fourth, the remainder being made up of the phosphate and carbonate of lime and soluble salts. Lassaigne found that one hundred parts of an ossified artery contained fifty parts of animal matter, forty-seven and a half of phosphate of lime, two of carbonate of lime, and a few traces of sulphate of lime. The results of these experiments are extremely interesting, because they serve to show, as was before intimated, that the calcareous deposit varies in its composition in different individuals, at different periods of life, in different parts of the arterial system, and even in different portions of the same vessel.

Various opinions have been entertained by pathological anatomists respecting the precise seat of this deposit; some placing it in the substance of the lining membrane, others in the middle coat, others in the cellular texture, by which these two layers are connected together. The latter of these views is borne out by the analogy which is observed in the subserous cellular tissue in other parts of the body; but, independently of this, I am disposed to adopt the opinion from personal observation, too carefully conducted, and too often repeated, to permit me to entertain any doubt upon the subject. At the same time, it must be admitted that this matter may occasionally be poured out into the substance of the different tunics, otherwise we could not account for the deposit being entirely limited, as it sometimes is, to the exterior of the arteries. The exciting cause of these formations is chronic inflammation, seated in the cellular element of the arterial structures.

Another deposit to which the arteries are subject is the *atheromatous.* This affection, I have reason to believe, is extremely rare in the native inhabitants of our country, but appears to be very common in Europe and in our foreign emigrants. It usually begins in the cellular substance which connects the inner and middle tunics, in small isolated points, not larger than the head of a pin, of a pale yellowish, white, or brownish color, somewhat greasy to the touch, and of a semi-concrete friable consistence. As these points or dots augment in size, they push the lining membrane beyond its natural level, and if they are at all numerous, or if several of them are seated together, their tendency is to become confluent, and to form irregular patches, which may involve the whole circumference of the tube, and extend several lines or even inches up and down. I have never seen this deposit arranged in streaks or lines, such as we observe in the degeneration which precedes the formation of bony matter, nor have I found it entirely limited, as it is said occasionally to be, to the inner coat.

Fig. 60.



Atheromatous deposits. From a preparation in my collection.

After having remained stationary for an indefinite period, this heterologous product manifests a disposition to soften, and is ultimately converted into a friable, curdy substance, possessing apparently all the properties of scrofulous pus. When the disease has reached this point, the lining membrane is frequently elevated into small pustules or little abscesses, which, when ruptured, leave a corresponding number of ragged and irregular ulcers, the base of which is formed by the substance of the middle coat; this lesion is frequently associated with the fibrous or calcareous formation, and with more or less opacity, thickening, and corrugation of the lining membrane. Though the quantity of new matter is seldom very great, yet its tendency uniformly is to impair the elasticity of the arterial tunics, and to dispose them to laceration. The disease is most frequently witnessed in strumous subjects, after the thirty-fifth year.

Atheromatous deposits, examined with the microscope, are found to consist of albuminous and earthy particles, of crystalline plates of cholesterine, of an imperfect fibrous texture, and of oil-globules. The fatty matter is often so plentiful as to impart a greasy stain to paper when dried on it by heat. Atheroma would thus seem to consist in a fatty transformation of a fibrinous exudation, having its primary seat under the inner coat of the artery. Mr. Gulliver was the first who broached this view, which he has since confirmed by repeated investigations of the subject. I was formerly of opinion that these deposits were of a tubercular nature, but in consideration of the numerous minute examinations now on record, this opinion seems to me no longer tenable.

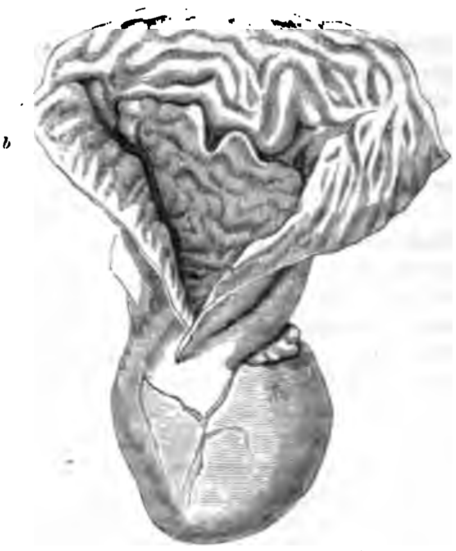
The most frequent seat of atheromatous deposits is the aorta, particularly the thoracic portion, in the neighborhood of the origin of the great cervical trunks. The affection is common in advanced age, but is not noticed in infancy and childhood. A somewhat similar change, but involving more especially the coats of the vessels and leading to their atrophy, occurs in the fatty degeneration of the smaller arteries, whose tissue is seen destroyed, and replaced by shining oil-globules. This change is most frequently met with in the cerebral vessels, and predisposes to their rupture.

Much less frequent than the deposits now described are the *melanotic* and encephaloid. These, in fact, are among the rarest affections of the arterial tissue. When occurring in this situation, the melanotic matter is usually effused into the subserous cellular substance, in the form of minute dots, or in that of small irregular patches. The encephaloid matter, on the contrary, although it is occasionally seated in the same locality, more frequently occupies the interior of the artery, assuming an arborescent arrangement, and filling up its caliber.

10. *Hypertrophy.*—Hypertrophy is well exemplified in the arteries of the uterus during gestation, and in the growth of various tumors, especially such as attain a great bulk. In these states of the system they often become extremely capacious, elongated, and tortuous, being coiled up like varicose veins. The object of this augmentation of volume is to allow a larger quantity of blood to flow into the growing part; and hence, in the instance of the uterus, we find that, as soon as the child is expelled, the dilated and thickened arteries gradually revert to their former dimensions. Hypertrophy of these vessels is generally associated with hypertrophy of the veins, and is, in most cases, purely physiological, there being no discernible lesion whatever

of their tunics. Figure 61 is an admirable specimen of hypertrophy of the aorta near the heart. The tunics of the vessels are enormously thickened, in addition to which the inner and middle are greatly corrugated, or elevated into irregular ridges.

Fig. 61.



Hypertrophy of the aorta. *a*. The heart. *b*. The aorta. From a preparation in my collection.

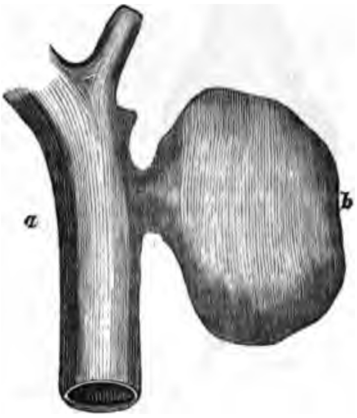
11. *Contraction.*—Contraction of the arteries, either alone or associated with dilatation, occasionally exists as a congenital defect; but, in the great majority of instances, it is the result of inflammation, most commonly of the chronic kind, giving rise to fibrinous concretions, atheromatous deposits, or calcareous degeneration. In this way, the caliber of the vessel is sometimes completely obliterated, and its texture transformed into a dense ligamentous cord, the circulation being carried on by enlarged collateral channels in the same manner as when an artery is secured by ligature. Hitherto, this lesion has been observed more particularly in the larger trunks, especially in the aorta, but no part of the arterial system is exempt from it. Indeed, there would occasionally seem to be a peculiar predisposition to this contraction, the capacity of almost every vessel in the body being sensibly affected by it. The pulmonary artery, although seldom implicated, is sometimes remarkably contracted, as in the case observed by Dr. Knox, of Edinburgh, in which it was reduced to the size of a small goose-quill.

12. *Dilatation* or *Aneurism.*—Dilatation of the arteries, constituting what, in surgical language, is termed aneurism, is one of the most frequent lesions to which these interesting structures are liable. Varying in size and shape, under different circumstances, the enlargement exists sometimes at one point, sometimes at several, and sometimes is more extensively diffused, occupying the whole circumference of the tube. In the majority of instances, the disease is seated in the larger trunks; but occasionally it attacks the smaller branches, and not unfrequently even the capillaries. Aneurismal enlargements may be divided into five principal varieties, the sacculated, cylindroid, varicose, dissecting, and anastomotic. To these may very properly be added another, namely, the arterio-venous, or that form of the disease which has been described under the name of aneurismal varix.

When a tumor of this kind is composed of all the arterial tunics it is called a true aneurism; if, on the other hand, it consists only of the external coat, the inner and middle being ruptured, ulcerated, or destroyed, it is denominated a false aneurism. Of these two varieties, the latter is by far the more common. Cases occasionally occur, though rarely, where, in consequence of the laceration of the fibrous membrane, the internal coat is protruded across the crevice, in the form of a hernia, which gradually encroaches upon the cellular membrane, and thus dilates it into a distinct pouch.

*a.* In the *sacculated aneurism* (Fig. 62), the coats of the artery are dilated into one or more pouches, occupying only a limited portion of its circumference. It occurs most frequently in the great trunks, particularly the thoracic aorta, and occasionally affects all the principal branches of the body. Pelletan examined an individual, in whom he discovered upwards of sixty of these dilatations; and a still more extraordinary example has been reported by Cloquet. In this case, the number of tumors was upwards of two hundred. The subject was fifty years of age. They affected almost every artery in the body, even the aorta and its principal divisions, but they were most numerous in the extremities. The axillary, humeral, radial, and ulnar arteries, the femoral, popliteal, tibial, and peroneal, were closely studded with them. In volume they varied between that of a millet-seed and a large pea. In other respects, the coats of the vessels were perfectly healthy. There would thus seem to be occasionally a real aneurismal diathesis. Much diversity obtains in relation to the dimensions of these sac-like projections; in some instances, as has just been seen, they are remarkably small, whilst in others they acquire the magnitude of a large egg, the fist, or even of a mature fœtal head. The manner in which they are attached is also subject to considerable variation, but generally it is by a narrow footstalk or a tolerably broad base.

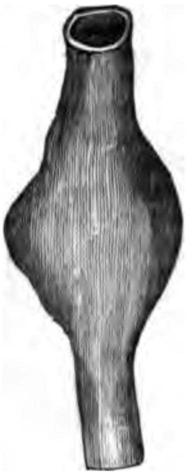
Fig. 62.



Sacculated aneurism: *a.* Artery; *b.* Aneurismal pouch. From a specimen in my collection.

The orifice of communication between the sac and the artery varies in different preparations. When the tumor arises by a narrow footstalk the opening is usually proportionably small, with smooth and well-defined margins. When, on the other hand, it is attached by a broad base, the aperture is always much larger, and its edges are also more irregular, sometimes, indeed, quite shreddy and ragged, as if they had been torn. The situation of the orifice is commonly towards the centre of the sac, but it may be at one side, or even at one of its extremities. The form of the opening is extremely variable, and admits of no specific description. In the early stage of the disease, and in nearly all cases where the tumor is small, the orifice is of a rounded or circular configuration, while in cases of an opposite character it is generally more or less irregular. The internal and middle tunics may terminate abruptly at the margins of the opening of communication, or they may extend into the cavity of the sac, and thus serve to give it a partial lining.

Fig. 63.

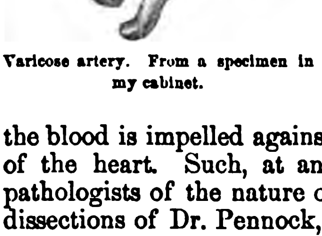


Cylindroid aneurism. From a preparation in my collection.

*b.* The *cylindroid aneurism* (Fig. 63) is of an elongated spherical shape: the dilatation, which is pretty nearly uniform, embraces the entire circumference of the vessel, varying in length from a few lines to several inches. The coats are generally thickened, and the inner surface of the tube is rough, uneven, and covered with thin, irregular layers or patches of fibrin. In some instances, the dilatation is truly enormous. In a specimen of cylindroid aneurism of the arch of the aorta in my cabinet, the tumor measures upwards of ten inches in circumference, by five and a half in length. It formed an immense ovoidal swelling in front of the neck, which extended nearly as high up on the left side as the angle of the jaw; whilst below, it pressed upon and destroyed the inner half of the clavicle, part of the first rib, and a small portion of the breast bone. Almost all the arteries in the body are sometimes affected with this species of enlargement.

*c.* The *varicose aneurism* (Fig. 64) consists, as its name imports, in an enlarged and nodulated state of the artery, similar to that of a varicose vein. The dilatation ordinarily embraces a considerable portion of the length of the vessel, the coats of which are at the same time very thin and brittle, preternaturally light, and readily collapse when divided. In this variety of the disease, the artery is remarkably elongated, tortuous, and convoluted; the lesion seldom occurs in the larger trunks, but is most frequently observed in the secondary and ternary divisions, as the splenic, carotid, humeral, femoral, tibial, radial, temporal, and occipital.

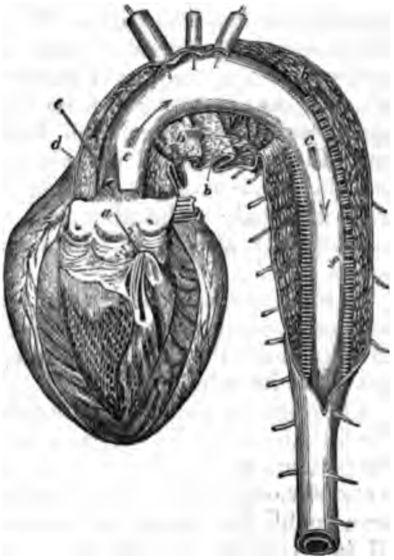
Fig. 64.



Varicose artery. From a specimen in my cabinet.

*d.* The *dissecting aneurism*, which is entirely limited to the aorta and the large trunks which arise from it, or in which it terminates, consists in a separation of the middle and external tunics of the affected vessel, preceded by ulceration, fissure, or rupture of the lining membrane, caused by the force with which the blood is impelled against it by the contraction of the left ventricle of the heart. Such, at any rate, is the account usually given by pathologists of the nature of this affection; but the observations and dissections of Dr. Pennock, confirmed by a careful personal examination of nearly all the published cases of dissecting aneurism, render it exceedingly probable that it is generally situated between the lamina of the middle tunic, and not between the latter and the external. The manner in which the lesion takes place is easily understood. In the natural state the different coats are so intimately connected together that it is almost impossible, even by the nicest dissection, to detach them from each other; but when they are altered by disease, or by some of the degenerations to which they are so liable, the connecting cellular tissue is rendered soft and friable, and their separation may then be effected with the greatest facility. In this condition, moreover, the tunics themselves are frequently very much changed, so that they are scarcely able to resist the slightest impulse. Now, if under these circumstances the lining membrane gives way, whether from ulceration, erosion, or rupture, the blood will insinuate itself into the accidental opening, which is thus gradually enlarged, at the same time that the fluid is forced on between the layers of the weakened middle tunic, dissecting them from each other as with a knife, and forming thus either a blind pouch, or a distinct canal, open at both extremities, or at some intermediate point.

Fig. 65.



The appearances presented by the dissecting aneurism are depicted in Fig. 63, from Pennock: *a.* Semilunar valves; *b.* External vessel laid open in its entire extent, so as to expose the aorta at c; *d.* Valvular opening in the coats of the aorta, showing the communication of this vessel with the artificial channel, *b*; the probe *e* passes through the abnormal opening: *f* shows the foramina between the aorta and the outer canal.

The detachment is not of the same extent in all cases. It very rarely, in fact, embraces more than one-fourth, one-half, or two-thirds of the circumference of the tube, while in length it may vary from six, eight, or ten lines to as many inches. Occasionally it reaches nearly from one extremity of the aorta to the other, being perhaps prolonged at the same time into the carotid, subclavian, and iliac arteries. The new channel is seldom of uniform size, but is apt to be larger at some points than at others; it runs parallel with the old canal, lying either in front or on one side of it, and is always lined by an adventitious membrane, thicker than the corresponding membrane of the aorta, of a fibro-serous nature, semi-transparent, and of a light maroon, yellowish, or grayish-brown color. The septum between the two tubes is composed of the internal membrane and of one or more of the lamellæ of the middle tunic, which are usually considerably hypertrophied, and much firmer than in the natural state.

The accidental channel presents itself either in the form of a pouch or cul-de-sac; or, after descending some distance, it communicates with the old canal by a distinct rent. The inlet of the factitious route is generally a mere slit or fissure, with thin, ragged edges, from six lines to an inch and a quarter in length, and directed transversely, obliquely, spirally, or longitudinally. The inferior opening, or outlet, is also liable to much diversity, both in regard to its size, shape, and inclination; but generally it is considerably smaller than the upper, from which it may be situated from five to eight or even ten inches. The apertures of communication between the old and new channels are generally multiple. When this is the case, they are commonly nothing but the orifices of pre-existing vessels, the relations of which have been changed by the abnormal separation. The external tunic may be variously altered, but in a majority of cases it is comparatively sound.

In some cases the new vessel compresses the old, changing its direction, and assuming its functions. The blood, however, never passes entirely along the collateral route, and hence the original vessel always preserves its tubular form.

The dissecting aneurism appears to be most common in women, after the fiftieth year. In six cases, where the sex is mentioned, I find that the patients were all females, four of whose ages, respectively, were fifty, sixty, seventy-five, and one hundred. In seven cases, of which I have been enabled to obtain the particulars, the heart was hypertrophied in all, in some enormously; there was also more or less disease of the mitral or semilunar valves, or of both; and the aorta was either ossified, sacculated, or the seat of atheromatous deposits. Death in several of the cases was caused by a rupture of the aneurism, and an escape of blood into the pericardial sac.

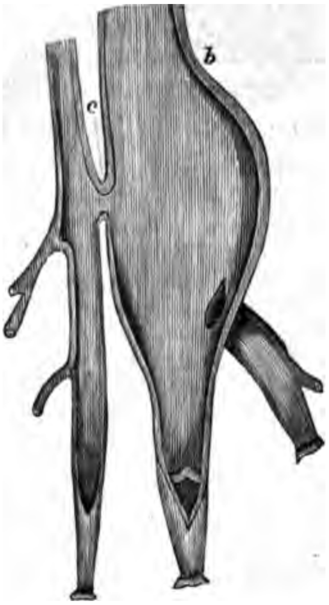
Spontaneous aneurism is most frequent between the ages of thirty and fifty. Before twenty and after sixty the disease is very rare. The dissecting aneurism is exclusively confined to old people. Men are much more liable to ordinary aneurism than women, for the reason, doubtless, that they are much more frequently exposed to the exciting causes of the malady, as violent muscular exertion and all kinds of hardship, whereas females always lead a more sedentary and tranquil life.

Spontaneous aneurism is most common, first, in the aorta, next in the popliteal artery, then in the femoral, and lastly, in the carotid, subclavian, axillary, external iliac, and innominate. The arteries of the leg and foot, the head, and the superior extremity rarely suffer in this way. Aneurism of the pulmonary artery has been observed only in a few instances. The reason of this comparative exemption exists in the fact that the vessels here mentioned are so seldom assailed by the fibrous, fibro-cartilaginous, osseous, and other degenerations so common in the aorta and in the arteries of the thigh and neck.

Most of the species of aneurism here enumerated are dependent, directly or otherwise, upon an altered or modified state of the arterial tissues. The internal and middle tunics are commonly most affected; indeed, it is rare to find them perfectly free from disease. The calcareous, cartilaginous, or atheromatous deposits, noticed in a previous page, are usually present; and oftentimes the aneurismal pouch is exclusively formed of the outer coat, the other two being entirely destroyed. In the sacculated variety of the disease, as well as in some of the rest, one of the earliest effects consequent on the development of the tumor, is the deposition of the fibrin of the blood, as this fluid sweeps over its inner surface. This deposition, which generally occurs in concentric layers, is sometimes remarkably abundant. Its thickness varies from six to eight lines, according to the age and size of the sac, but it may exceed two inches. The oldest lamellæ, or those lying directly in contact with the inner surface of the tumor, are generally of a whitish, grayish, or yellowish color, remarkably hard, dry, and brittle; whereas those which are of recent formation are always of a darker hue, soft, and elastic.

*e.* The last form of dilatation to be noticed is the *arterio-venous* (Fig. 66), or, as it is generally denominated, *aneurismal* varix. Although this lesion is most apt to happen at the bend of the arm, where the median basilic vein lies over the humeral artery, yet it may occur in any part of the vascular system in which two considerable sized trunks of this kind are contiguous. In most instances, it follows upon the operation of venesection, but occasionally it arises spontaneously, or, more properly speaking, as an effect of ulceration.

Fig. 66.



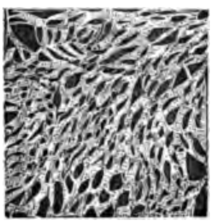
Arterio-venous variety of aneurism; *a.* The artery; *b.* The vein; *c.* The opening between them.

When produced by a sharp-pointed instrument, as, for instance, the lancet, the superficial wound generally heals by the first intention; but that between the two vessels remains permanently patent, and thus allows the blood to flow readily from one to the other. By degrees the channel here established augments in diameter, and the two vessels are either effectually agglutinated together, or their connecting cellular substance is injected with blood, so as to form a sort of globular pouch. The artery and vein, in the mean time, become sensibly altered, both as respects the size of their caliber and the texture of their parietes. The former, which now receives black blood, is gradually dilated into a soft, thin flexuous tube, which ultimately acquires all the properties of a vien. These changes, which are always most distinctly marked in the immediate neighborhood of the preternatural aperture, frequently extend as low down as the first large collateral branch, and their invariable effect is to obscure the pulsation in the corresponding part of the limb. The vein also loses, in some measure, its normal characters. It becomes large and tortuous, both above and below the seat of the injury, acquires an extraordinary degree of density, and is no longer either so extensible or elastic. The cause of these textural changes is chronic inflammation, leading, in the one case, to partial atrophy, in the other to partial hypertrophy; or, in other words, what one vessel loses, the other gains.

This species of aneurism, which is generally of slow formation, seldom acquires any great bulk. It may be as large as an egg, but ordinarily it does not exceed the volume of a common plum. It communicates to the hand a sort of jarring sensation, and to the ear a peculiar hissing sound, not unlike what would result from the prolonged articulation of the letter R, which are the pathognomonic signs of its existence.

*f.* The *anastomotic aneurism* (Fig. 67), usually described by the German pathologists under the name of *telangiectasy*, is composed of a congeries of convoluted capillary arteries and veins, dilated into a soft pulsating tumor, generally of a bright florid tint, but occasionally of a bluish, mulberry, or purple color. In some instances, it appears as a congenital disease, constituting what is called a *nævus maternus*. When of long standing, the vessels are often dilated into small sacs, and so form a truly erectile tissue, analogous to that of the penis, nipple, or wattles of the turkey-cock. Although every part of the capillary system is probably susceptible of this singular dilatation, yet the most frequent situations of anastomotic aneurism are the head, hands, and feet. In a few rare instances, it has been observed on the gums and inside of the cheeks. There is a form of hemorrhoidal tumor, which, as will be subsequently shown, is probably merely a variety of anastomotic aneurism.

Fig. 67.



Anastomotic aneurism.

This species of aneurism often acquires a considerable magnitude. Its progress is not always rapid; occasionally, indeed, it remains stationary for years. Ultimately, however, ulceration sets in, and in this way the tumor becomes the seat of frequent hemorrhages.

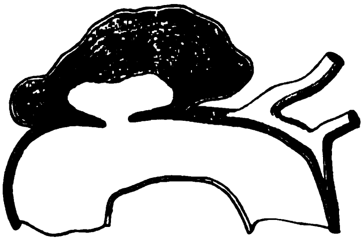
*Duration and Termination.*—The duration of aneurism is influenced by so many extraneous and intrinsic circumstances that it is impossible to lay down any specific rules in regard to it. In a majority of cases it does not exceed six or eight months, while in many it terminates much sooner, and in a few it may continue from one to two or three years. The disease proves fatal much earlier in old persons than in the young or middle aged, and in false than in true aneurism. Aneurism by anastomosis may last for many years before it bursts, and the same remark is true of the varicose and arterio-venous forms of the affection. The occupation of the patient, the situation of the tumor, the state of the arterial tunics, and the energy of the circulation, are the circumstances which mainly influence the duration of the disease.

An aneurismal tumor, after having attained a certain size, manifests a disposition to burst, which it does either as an effect of ulceration, or of inflammation and gangrene. In either case, life is destroyed in the same manner, namely, by hemorrhage, which may be sudden nd copious, or slight and gradual, according to the extent of the ccidental opening. In the neck, groin, and extremities, the tumor enerally breaks upon the surface; in the chest and abdomen, into he serous cavities, or into some of the adjoining viscera. Aneurism f the arch of the aorta usually bursts into the pleura, pericardium, rachea, bronchial tubes, œsophagus, or posterior mediastinum. Rup-ure into the substance of the lungs is very rare. Sometimes a ommunication is established between the tumor and the heart, or etween it and the pulmonary artery. The tumor has also been nown, though very rarely, to burst into the spinal canal, one or more f the bodies of the vertebræ having been previously destroyed by lcerative absorption. Aneurism of the abdominal aorta may burst nto the peritoneal cavity, stomach, bowels, or urinary bladder.

*Repair.*—Aneurism does not necessarily prove fatal. Nature occa-ionally sets up a process of reparation, and of this there are not less han five different modes, all founded, however, upon the same principle.

*a.* The most common process is the formation of fibrinous concre-ions, by which the whole interior of the sac, with the exception of a mall narrow channel, is gradually filled up; the affected artery itself remaining pervious, and carrying on the circulation. (Fig. 68.) Of this variety of cure many examples are on record. The most interesting specimen of the kind that has fallen under my observation was presented to me by a former pupil, Dr. Shumard. The tumor, which involved the hepatic artery of a young bullock, was of the volume of a large goose egg, of a globular form, and occupied by an immense number of concentric lamellæ, of a dense, firm texture, of a pale grayish tint, and strongly united to each other and to the inclosing sac by short cellular substance. The affected artery was perfectly free, and the blood passed readily from one orifice of the vessel to the other, across a sort of groove or channel in the upper part of the tumor. These appearances are well seen in the annexed cut (Fig. 69). In some instances the aneurismal sac is completely filled by the fibrin, the artery is obliterated, either partly, or in the whole of its length, and the circulation is entirely arrested.

Fig. 68.

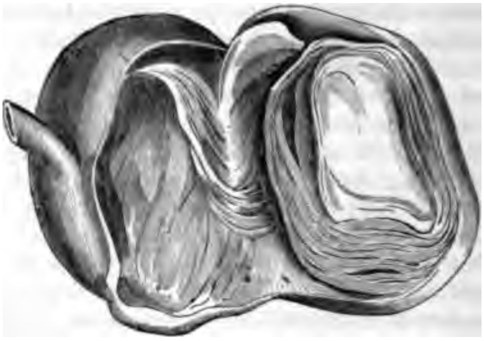


Aneurism of the aorta. The greater part of the cyst filled with clot. Aperture of communication small.

*b.* Reparation may be effected by the development of inflammation, accompanied by the coagulation of the blood both in the sac and in the artery, and followed by profuse suppuration. Ulcerative absorption takes place, and the matter is discharged along with the contents of the tumor, the sides of which gradually approach each other, and finally unite by granulations.

*c.* Tumors are sometimes developed in the course of the affected artery, and by pressing upon it, either on the cardiac or capillary side of the aneurism, may lead to the coagulation of the contents of the latter, and the occurrence of a spontaneous cure. The same e may be produced by the aneurism itself, especially when of large overlapping and blocking up the connecting artery.

Fig. 69.



An aneurismal tumor obliterated by the deposition and organization of fibrin. From a preparat my collection.

*d.* A fourth mode is by gangrene, commencing either in the itself, or in the structures immediately around it. The blood co lates here as in gangrene of other parts of the body, the content the sac are discharged along with the sloughs, an abundant supp tion is established, granulations spring up, and the affected arter not only obliterated but ultimately transformed into a dense ligam ous cord. This mode of reparation, like the last two, is very ir quent, for the patient usually dies either from the violence of morbid action, or from the effects of hemorrhage.

*e.* A rare process of reparation consists in a clot of blood, detac by a blow, contusion, or violent concussion, finding its way into opening of communication between the aneurism and the artery, thus effectually intercepting the circulation in both.

Soon after the circulation within the aneurismal pouch is fi arrested, whether by the formation of fibrinous concretions, the i sion of gangrene, or the effusion of purulent matter, a proces absorption commences, leading to important changes in the débr the tumor. The internal concretions are transformed into pale, whi yellowish, or grayish lamellæ, while the cyst by which they are rounded assumes the character of a dense, fibrous membrane, altoge unlike the coats of the artery with which it is connected, and of w it originally formed a part. Whether the tumor is ultimately enti absorbed, or whether a portion of it remains, and gives rise to little nodules occasionally seen on the exterior of larger vascular tru is a question which we have no means of determining. The gen opinion is, that these bodies are nothing but aneurismal sacs, w have been filled up by lamellated coagula, and the volume of w has been diminished by absorption.

*Effects on Neighboring Parts.*—The influence which aneurism ex upon the adjacent structures varies according to the size and situa of the tumor. As long as the sac is small the effects will be proportionably slight, if not imperceptible; but as it augments in volume, it will necessarily produce more or less pressure upon the parts with which it lies in contact, and thus lead to changes of a marked and serious character. In the neck the tumor may embarrass the circulation of the jugular vein, and thereby cause cerebral congestion, headache, vertigo, and intumescence of the face. By compressing the trachea and œsophagus it may occasion difficulty of respiration and deglutition. In aneurism of the thoracic and abdominal aorta, the heart, lungs, and other organs are liable to be displaced, deformed, partially atrophied, and more or less changed in their structure. The thoracic duct and vena cava are sometimes very much compressed, and partly, or even entirely obstructed. The common carotid and subclavian are occasionally obliterated by the pressure of an aneurism of the aorta. In aneurism of the popliteal artery the pressure of the tumor often intercepts the passage of the blood in the branches below, so as to lead to gangrene of the whole limb.

The bones in the neighborhood of the aneurismal tumor frequently experience important changes. The pieces most liable to suffer are the vertebræ, ribs, sternum, and clavicle, which may be eroded, ulcerated, excavated, atrophied, or even in great measure destroyed. The cartilages, fibro-cartilages, ligaments, and aponeuroses seldom undergo much alteration, no matter how great or protracted the pressure exerted by the tumor. The muscles are wasted, changed in color, and transformed into thin, elongated, ribbon-shaped bands; the nerves are stretched and flattened; the cellular tissue is infiltrated with serum and lymph; and the skin, gradually attenuated, is ultimately invaded by ulceration or gangrene. In cases of long standing, the soft parts around the tumor are sometimes very much condensed, and a sort of adventitious cyst is formed, similar to what is observed in certain varieties of chronic abscess.

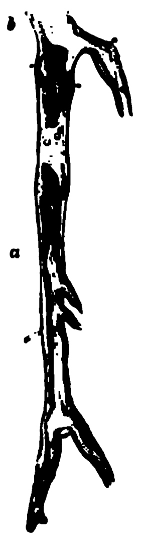
## CHAPTER VI.

### VEINS.

**Lesions.—Acute Inflammation.—Suppuration.—Ulceration.—Chronic Inflammation.—Dilatation.—Obliteration.—Calcareous Deposits.—Phlebolites.—Admission of Air.**

1. *Acute Phlebitis.*—Acute inflammation of the veins is much more frequent than in the arteries; the reverse being the case in respect to the chronic form of the disease. It usually implicates a large extent of surface, often affecting a number of veins simultaneously, and, what is remarkable, always tending to spread in the direction of the heart. The

Fig. 70.



Fibrinous phlebitis. *a.* The femoral vein, occluded by solidified contents. At *b*, the saphena enters; and consolidation ends abruptly there.

anatomical characters of this disorder are swelling, opacity, and pulpiness of the internal membrane, with uniform redness, varying from light pink to deep florid. The middle and outer coats soon become deeply injected, and their proper substance, although at first preternaturally soft and humid, is at length rendered so dense and firm that the vein feels like a hard, contracted cord. The cavity of the inflamed vessel is filled with clotted blood, sometimes blended with pus or lymph, and in many cases it is lined by a false membrane, susceptible, under certain circumstances, of organization. Instances occur in which the pus is infiltrated into the substance of the vein, or collected into small abscesses beneath the lining membrane.

The pus generally resembles that of a phlegmonous abscess, and sometimes completely fills some of the larger veins of the womb and surrounding parts. In a case mentioned by Wilson,[1] the uterine and iliac veins were greatly thickened, and the abdominal cava contained upwards of four ounces of purulent matter, which was prevented from reaching the heart, partly by the contraction of the vessel near its entrance at the diaphragm, partly by a mass of pseudo-membrane. Suppuration is also liable to occur after venesection, amputation, compound fractures, and the application of the ligature. In the umbilical vein it often follows the tying of the cord, causing erysipelatous inflammation, which in a few days destroys life.

2. *Ulceration.*—Ulceration of the veins occurs much less frequently than in the arteries. Commencing most commonly at one or more points of the inner membrane, it gradually extends to the other tunics, which it sometimes completely erodes. The immediate effect of this accident is an effusion of blood, which may be so great as to produce fatal results. The ulcers, which affect various forms, are occasionally quite numerous, and spread over a large extent of surface.

3. *Chronic Phlebitis.*—The characters of chronic inflammation of the veins differ considerably from those of the acute form. The coats are usually much thickened, hypertrophied, and so dense that the vessel, when cut across, preserves its cylindrical figure, like an artery. The redness is of a brownish tint, interspersed with numerous shades of gray, violet, or purple; and the inner membrane, which is rough and shrivelled, can be easily raised in large opaque shreds. In some instances, the vein is dilated, or contracted, obstructed with clotted blood, lined by lymph, or filled with pus.

There are certain states of the system in which the veins seem to attain a very great size, carrying an inordinate amount of blood. This *hypertrophy*, for so it may be termed, is very conspicuous in chronic

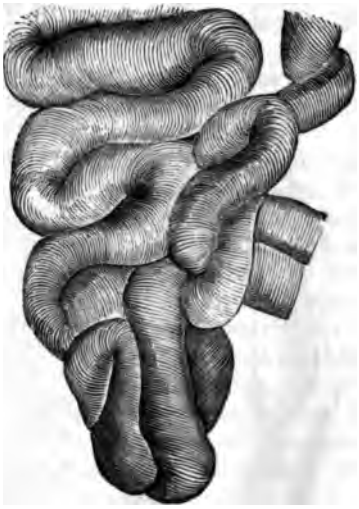
---

[1] Transactions of a Society for the Improvement of Medical Knowledge, vol. iii. p. 65.

.s of the joints, in vascular and malignant tumors, and in the the uterus during the latter months of pregnancy. It is always ɪd with hypertrophy of the arteries, and forms one of the most ɔbstacles to the cure of various diseases.

*latation.*—Dilatation (Fig. 71) is most frequently observed in the the testicles and lower extremities, in persons whose emploympels them to stand for a long ɔne position. It has also been d in the superior extremities, a few instances, I have witt in the superficial veins of the n. Of the deep-seated veins, ost frequently affected are the ian, jugular, azygos, and hedal. The vessels, in this disɪcome preternaturally large, ɪd, knotty, irregular, and torrinding in a serpentine manerneath the skin. Their coats ɔr of the normal structure, or ı thick and rigid, or thin and ɪd, or, finally, they are weak places, and hypertrophied in When laid open, they are o be rough and irregularly ed, strong bands being someretched across their interior, livide the vessel into little led with coagulated blood. The valves, although they genetain their normal texture, are sometimes thickened, indurated, d, or ruptured. This varicose state of the veins is usually l by chronic inflammation, and often leads to great and irrepaischief. In many cases, the vessels are converted into hard, linders, or their tunics are invaded by ulceration, followed by ion and profuse hemorrhage.

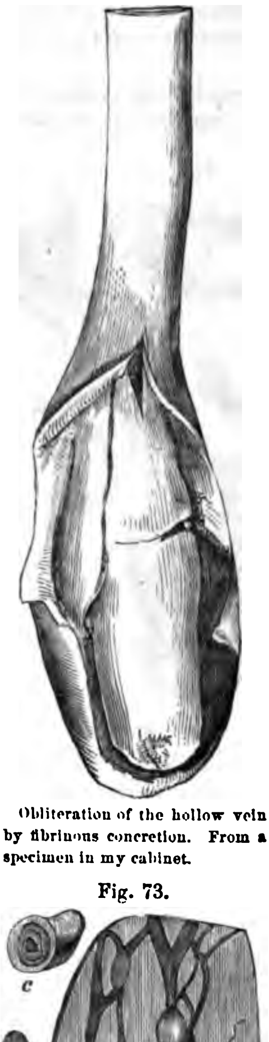
Fig. 71.



Varicose veins.

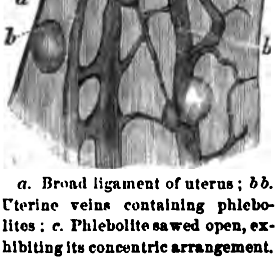
*literation.*—Obliteration of the veins is by no means uncommon, most always the result of inflammation. Sometimes it is caused pressure of a tumor forcing the sides of the vessel closely in and so converting it into a dense ligamentous cord. The veins are sometimes thus obliterated. Many years ago I exaalong with Professor Drake and Dr. Rives, the body of a man, ty, in whom the descending cava was closed by a plug of plastic from the second lumbar vertebra as high up as the liver. The etained its normal size, and the morbid substance, which was e straw color, and of the consistence of semi-concrete albumen, firmly to its inner surface, having evidently been deposited a ıe previous to death (Fig. 72). A similar substance was found portal and right renal veins, together with several of the veins of the left lung. All the abdominal viscera showed chronic disease, and, during the last two years of his life, the

Fig. 72.



Obliteration of the hollow vein by fibrinous concretion. From a specimen in my cabinet.

Fig. 73.



a. Broad ligament of uterus; bb. Uterine veins containing phlebolites; c. Phlebolite sawed open, exhibiting its concentric arrangement.

individual suffered, at intervals, from ascites. In another case, which I saw eighteen months ago, a similar substance was found in the external iliac and femoral veins, together with some of the smaller vessels of the pelvis. The most prominent symptom here, as far as the veins were concerned, was œdema of the corresponding extremity.

6. *Calcareous Deposits.*—Calcareous deposits within the coats of the veins are much more rare than in those of the arteries, this circumstance depending upon their difference of organization. Instances of this occurrence, however, are mentioned by various authors in the walls of the great hollow vein of the abdomen, in the femoral vein, and in the external saphenous. Whether the venous tissues are liable to the atheromatous degeneration, so common in the arterial, is questionable; at all events, I am not acquainted with a single recorded instance of it, nor have I met with it in my own dissections. A sort of fatty substance is occasionally found. Andral once saw a tumor of this description, about the size of a walnut, which exhibited all the anatomical characters of the adipose texture. It was developed in the substance of the great portal vein, the cavity of which it almost filled.

7. *Phlebolites.*—Loose concretions, phlebolites or vein-stones, varying in size from a currant to a pea, are occasionally found in the interior of these tubes (Fig. 73). Commonly of a yellowish, brownish, or bluish color, they are of a hard and brittle consistence, and of an oblong, oval, or spherical form, with a smooth, even surface. When divided by the saw, they are found to be made up of several thin but distinct lamellæ, disposed concentrically around a small, delicate nucleus, frequently consisting of fibrin. The number of these calculi is extremely variable; there are rarely more than two or three, though occasionally as many as ten, twenty, and even thirty, are observed. They are generally met with in the smaller veins; more frequently, perhaps, in the spermatic, uterine, vaginal, vesical, hemorrhoidal, and splenic, than in any other. In the saphenous and its branches, they often exist in connection with varicose enlargement. According to the analysis of Gmelin, subsequently confirmed by that of

r. Prout, vein-stones are composed principally of phosphate and car- onate of lime, with a small amount of animal matter, probably albu- en, and a trace of oxide of iron. A difference of opinion still prevails specting their mode of origin. Some suppose that they are developed the substance of the veins, whence they make their way into their terior by destroying the lining membrane; others, on the contrary, elieve that they are formed directly from the fibrinous matter of the lood itself. The rounded shape and polished surface of these bodies, ith the fact that the inner coat is often perfectly sound, strongly cor- borate the latter conjecture. I have repeatedly seen them in the ery centre of fibrinous clots, and been able to trace their progress, me portions being of an earthy nature, while others presented all e characters of the plastic substance of the blood blended with more r less hæmatosine.

8. *Introduction of Air.*—It has long been known that air thrown ddenly and in large quantity into the venous system, is often fol- wed by fatal effects. This circumstance, although long ago men- oned by Wepfer, Chabert, and other writers, appears to have been most entirely forgotten, until it was again brought before the pro- ession by the researches of Bichat, Nysten, Magendie, and Piedagnel. he experiments of these distinguished philosophers clearly prove at the insufflation of air into the veins produces instantaneous death, d that, on dissection, traces of this fluid can be detected in different arts of the body, particularly in the right cavities of the heart. As accidental occurrence, this effect is sometimes witnessed in surgical perations, involving the jugular, subclavian, or axillary veins, and such it was first noticed by M. Beauchene, of Paris, in 1818, in tting out a tumor from the neck of a young man. The dissection as nearly finished, when the patient suddenly became faint, and xpired in forty-five minutes from the commencement of the opera- on. On examining the body, an aperture was found in the internal gular vein, from which the air had evidently descended along the perior cava to the right chambers of the heart, thereby causing eath. Since that period, similar results have been observed by any other surgeons.

It is a singular fact that the effects from this cause are much less iolent, if the air be introduced gradually and in small quantity into e veins. The only difficulty, indeed, that is produced in this case a momentary excitement of the action of the heart. If the insuffla- on, however, be repeated for several days, at intervals of six or eight ours, the powers of this organ will become very much weakened, d the pulmonary tissues so far deranged as to give rise to severe ough, frothy expectoration, and considerable embarrassment of the spiratory function. When the air is suddenly injected, the animal instantly seized with partial syncope, utters cries expressive of ffering, and quickly expires. In the human subject, the accidental troduction of this fluid is sometimes attended with a peculiar hissing oise, like that which is heard when the air rushes into an exhausted ceiver. In other cases, symptoms of apoplexy ensue; the counte- ance is of a livid complexion; the respiration deep and stertorous;

the pulse slow, laborious, and almost imperceptible; the surface is bathed with cold perspiration, and the patient is perfectly insensible.

The question may be asked, in what manner does air, when introduced into the venous system, operate so as to produce these deleterious effects? This question, as might be anticipated, has been variously answered by different writers. By some it is maintained that the fluid acts principally, if not entirely upon the brain, causing symptoms of violent congestion, loss of sensibility, and spasmodic rigidity of the muscles; an explanation which is favored, in some degree, by the experiments of Nysten and Magendie, in which they induced apoplectic phenomena, by injecting air into the carotid arteries of animals. Others, on the contrary, believe that the primary obstacle is in the lungs, since these organs have been found in a condition similar to what is observed in asphyxia. Piedagnel and Leroy, from having seen these structures in a lacerated and emphysematous state, suppose that death is caused solely by this lesion. But the grounds for these opinions are by no means conclusive; and we are at last compelled to resort to the explanation, long ago suggested by the French physiologists, that the fatal effects in question are the result of the sudden distension of the right cavities of the heart, whereby the powers of that viscus are partially paralyzed, and the circulation materially impeded. This view is strongly corroborated, in the first place, by the fact, already adverted to, that if the air be introduced into the veins in a slow and gradual manner, little or no functional derangement will manifest itself in either of the above organs; secondly, by the almost total failure of the pulse in cases of an opposite description; thirdly, by the remarkable insensibility of the patient; and, fourthly, by the circumstance that the foreign fluid is usually found in greatest abundance in the right chambers of the heart.

---

# CHAPTER VII.

## LYMPHATIC VESSELS AND GANGLIONS.

I. *Lymphatic Vessels.*—Liability to Inflammation and Suppuration.—Tubercular Deposits.—Dilatation.—Aneurism of the Thoracic Duct.—II *Lymphatic Ganglions.*—Lesions.—Inflammation and its ordinary Consequences.—Hypertrophy.—Encephaloid Disease.—Tubercle.—Ossification.—Melanosis.

## SECTION I.

### LYMPHATIC VESSELS.

As the lymphatics are so extremely delicate, it is by no means easy to detect in them those various alterations of structure to which they are liable. The following remarks, therefore, embracing a rapid outline of the principal lesions of this system of vessels, will have special reference to the left thoracic duct, in which it is alone possible, in the generality of cases, to detect any deviation from the normal standard.

1. Bichat long ago affirmed that the lymphatics are much more frequently affected with *inflammation* than the veins, an opinion which has been amply corroborated by the observations of more recent writers. In the early stage of the disease, the lining membrane is of a light reddish tint, opaque, slightly thickened, and preternaturally dense, yet so friable as to allow itself to be peeled off readily in small pellicles. As in the veins, the discoloration occurs at first in minute, circumscribed patches; after some time, however, it becomes uniform, deeper, and gradually invades the other tunic, the vessels of which, very much injected, may be seen ramifying in every direction, forming a network so delicate as to render it difficult to distinguish it with the naked eye. Flakes of lymph are sometimes found adhering to the inner surface; and, in violent cases, it may even be bathed with pus. Under these circumstances, both tunics are of a deep red, violet or purplish color, soft, and spongy, and the surrounding cellular tissue is swollen and infiltrated with serous and other fluids. The proper nutrient vessels, also, are excessively engorged with blood, and are no longer permeable to injecting matter.

When the superficial lymphatics are affected, they can be easily traced underneath the skin, like small red cords, tense, nodulated, and painful to the touch, accompanying the principal veins, and going as far as the first conglobate glands, rarely beyond them. This appearance, which is well seen in dissecting wounds, in punctures, and in poisoned wounds, is often attended with considerable swelling and œdema of the connecting cellular texture.

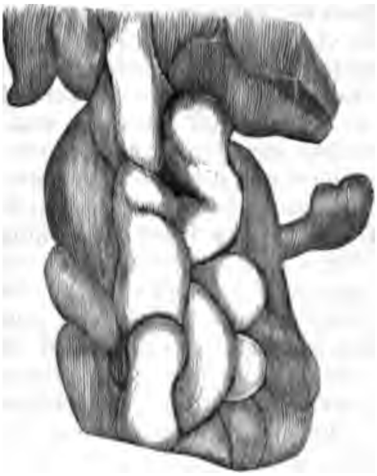
Such is a succinct outline of the anatomical features of acute inflammation of the lymphatics. Of those which mark the chronic form of the disease, nothing need be said in this place, as they have not been properly investigated. That they are very analogous to those characterizing chronic inflammation of the veins, is highly probable; at least, such must be our conclusion, when we reflect upon the similarity of structure and function of these two systems of vessels.

2. It has been already stated that *suppuration* sometimes takes place in these vessels, and it may now be added that they occasionally contain pus, the result obviously of absorption. Mascagni states that it is by no means uncommon to find purulent matter in the pulmonary lymphatics in phthisical subjects; and it is well known that the same occurrence has been repeatedly seen in those of the womb and inferior extremities in women dead of phlegmasia dolens. It is still undecided whether acute inflammation ever terminates in gangrene; but there is reason to believe that such an event is not only extremely rare, but that it never occurs as an idiopathic affection.

3. The lymphatics sometimes contain *tubercular* matter, but the occurrence is rare; it is noticed chiefly in those of the lungs, groin, and pelvis, in union with similar deposits elsewhere. A calcareous, chalky, or bony substance has also been found in them. Occasionally, again, their coats are partially ossified.

4. A remarkable *dilatation* of the lymphatics is sometimes observed, giving them a tortuous, varicose arrangement. (Fig. 74.) This lesion is well illustrated by a case mentioned by Dr. Carswell. The subject of it was a young man, twenty-six years of age, who died with two swellings, one in each groin, nearly as large as an orange, for which he had worn a double truss from his boyhood, under the supposition that they were of a hernial character. On examining the patient after death, the tumors were found to consist of an enormous dilatation of the lymphatics of the inguinal glands. When cut into, instead of presenting a solid, compact structure, they had the appearance of a coarse sponge, the size of all the vessels being augmented, most of them being from one to three lines in diameter. The same phenomenon was seen, only more strikingly, in the absorbents of the pelvic and lumbar regions. None of them were less than two, and many of them from three to four lines in diameter, whilst the thoracic duct itself was fully three times the natural dimensions. Sœmmering has seen the lymphatics of the intestines varicose in hernia; and the same condition was witnessed by Bichat in those of the serous membranes in dropsy.

Fig. 74.



Dilated lymphatics.

Dr. Albers, of Bonn, has reported a case of what he terms *aneurism* of the thoracic duct. The patient, a man fifty-one years old, died of abscess of the liver. On examining the body, a knotty, elastic tumor was found, about the size and shape of a fig, and resembling very much a hydatid. Its walls were preternaturally thick and firm, and, on cutting through them, a director could be easily passed up and down the canal, thus showing that it was connected with the duct in question. The swelling was filled with thin, flaky lymph, and its inner surface was perfectly smooth and uniform. Baillie states that he has seen the thoracic duct varicose, and nearly as large as the subclavian vein.

5. The thoracic duct is sometimes *obliterated*. This may depend either upon a thickening of its tunics, the presence of a foreign body, or the reciprocal adhesion of its valves. However produced, this occurrence almost always impairs the nutritive function, though, owing to the numerous anastomoses of these vessels, and to their continuation with the veins, this process is perhaps never entirely interrupted, the chyle finding its way along collateral channels, just as the blood does after the tying of an artery.

## SECTION II.

### LYMPHATIC GANGLIONS.

The lymphatic ganglions are liable to inflammation, suppuration, gangrene, hypertrophy, carcinoma, tubercles, melanosis, and ossification.

1. In *acute inflammation*, the lymphatic glands are, at first, of a pale flesh color, hard and dense to the touch, considerably swollen, and cannot be torn with the same facility as in the normal state. When cut into, numerous minute points, of a brownish tint, and evidently the orifices of divided absorbents, may be observed; and, in many instances, blood is extravasated into the connecting cellular tissue, in circumscribed specks, not larger, frequently, than the head of a small pin. The covering of the glands, of a light reddish hue, is everywhere crowded with injected vessels, radiating in beautiful dendritic lines. At a more advanced period, these bodies acquire a dark violet color, become soft and spongy, from the infiltration of thin bloody matter, and, on being torn, their substance looks very much like that of the spleen.

In this affection, ganglions, naturally not larger than the kernel of an almond, may acquire the magnitude of an orange, or even of the fist; as is exemplified in cases of buboes, and in lymphatic swellings in the axilla, or about the neck. The tumefaction arises, apparently, from the internal connecting cellular tissue, or from thickening of the external coat of the absorbents, as these tubes are still pervious to mercurial injection. This disease may affect a singe gland, extend to several, or involve a whole chain or group.

Maceration in water for a few days in hot weather deprives the inflamed ganglion completely of its red color, and converts it into a soft grayish mass, which easily yields to the pressure of the finger. Boiling has the effect, at first, of rendering it dense and slightly elastic, and afterwards, friable and granular.

2. This disease occasionally terminates in *suppuration*, the period at which this event happens varying from a few days to a fortnight. The pus may be either diffused through the proper parenchymatous structure, converting it into a dirty, grayish mass, or it may be disseminated in distinct globules, or, finally, be collected into an abscess, which may be so large as to occupy the whole gland, the only thing that remains being its external envelop. The quantity of matter is sometimes very great; and, in the majority of cases, it is of a thin greenish character, intermixed with hard, cheesy flakes. The glands most liable to suppuration are those of the groin, axilla, neck, and jaw.

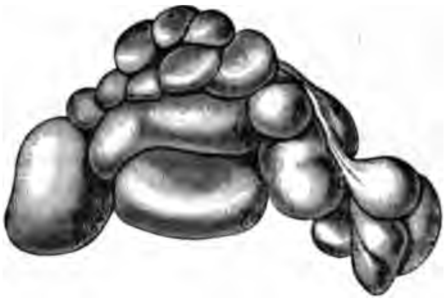
3. Acute inflammation sometimes ends in *gangrene*. When this takes place, the substance of the gland is of a dirty grayish color,

soft, pulpy, and bathed in a foul, fetid sanies, occasionally so acrid as to prove highly irritating to the surrounding parts. This termination of acute inflammation is well exemplified in cases of syphilitic buboes, occurring in debauched and worn-out habits. In such patients immense sloughs are sometimes formed, the gangrene gradually spreading from the affected glands of the groin to the adjacent textures.

4. In *chronic inflammation*, the lymphatic ganglions are hard, firm, not easily lacerated, and of a light brownish color, interspersed with streaks and specks of gray, which have the effect of giving them a mottled aspect; their substance is infiltrated with lymph; and, on being cut, they creak slightly under the knife, the section presenting a homogeneous aspect. The fibrous envelop is very dense and thick; and both its own vessels and those which are distributed to the proper parenchymatous tissue are tortuous, knotty, and dilated. The absorbents entering into the composition of these bodies are also more or less enlarged, though occasionally their cavity is so much diminished as to render it impossible to inject them. The disease sometimes passes into suppuration, the parenchymatous structure being entirely destroyed, the thickened and indurated capsule being the only part that is left. The pus in such cases is semi-concrete, and often remarkably offensive, apparently from its long sojourn in the parts.

5. Chronic inflammation leaves these glands sometimes in a state of *hypertrophy*, as in Fig. 75. In this condition, they may be perfectly white or grayish, or else they may acquire a light brownish or yellowish tint; their consistence, also, is frequently much augmented, and cases occasionally occur in which they are of a dense, gristly hardness, like *scirrhus*. The glands most liable to be thus affected are the mesenteric, bronchial, internal iliac, inguinal, and cervical. I have a preparation, taken from a child three years of age, in which the mesenteric ganglions, all matted into one general mass much larger than a fœtal head, are of a bluish gray color, homogeneous, and of the consistence of fibro-cartilage, each one grating sensibly under the knife. Many of them are as large as an orange, and they all have a very thick, indurated capsule, very much of the same tint as the altered parenchymatous substance.

Fig. 75.

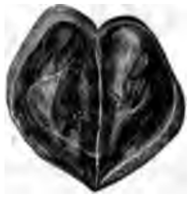


Hypertrophy of the lymphatic glands. From a specimen in my collection.

Hypertrophy of the lymphatic glands may arise from irritation, seated originally in their own tissue, or it may proceed from irritation propagated to them from the surrounding parts. In the glands of the mesentery, it is commonly caused by irritation of the bowels, especially the ileum; in the groin, by that of the penis; in the axilla, by that of the breast; in the neck, by exposure to cold; at the w, by disease of the gums, teeth, or tonsils. Great mischief is some- mes occasioned by this morbid development. An instance is men- oned in which the bronchial glands were so much enlarged as to duce fatal suffocation; and the internal iliac glands have repeatedly used death by preventing the descent of the child's head during rturition. When those of the mesentery are enlarged they may bstruct nutrition, and produce excessive emaciation, followed at ngth by loss of life. At the jaw, they sometimes produce perma- ent anchylosis; and at the transverse fissure of the liver, an enlarged mphatic ganglion has been known, more than once, to cause jaundice, y compressing the hepatic or choledoch duct.

6. It has been already mentioned that the lymphatic ganglions metimes acquire the hardness and density of scir- us, and it may now be added that they occasionally ntain *encephaloid.* When thus affected, they are etamorphosed into a soft brain-like substance, in- osed by a strong membranous cyst, with irregular brous filaments intersecting it in different direc- ons. Grumous matter is sometimes found in such mors, and now and then one part is medullary, an- her fibrous, another scirrhous. Serous cysts are also casionally seen. In a case of encephaloid of the axil- ry ganglions, which I observed in a man fifty-six ars of age, there was a single cavity of this kind hich fluctuated under the finger, and contained up- ards of eight ounces of sero-sanguinolent fluid.

Fig. 76.



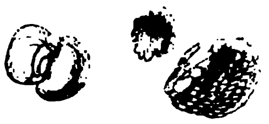
Melanosis of a lymphatic gland. From a preparation in my collection.

7. *Melanosis* of these glands is extremely rare. (Fig. 76.) I have oticed it in a few instances in the lymphatic glands of the groin and xilla, and these are, I believe, its most frequent seats. It occurs ither as an infiltration, or as an irregular tumor, solid, inelastic, and f variable size.

8. *Tubercles* are frequently observed in the lymphatic glands, occur- ing either in small isolated granules, in considerable clusters, or in the orm of infiltration. They are generally associated with tubercles of he lungs, and are most common in children between the ages of three nd ten. Louis considers this morbid change as peculiar to phthisis; nd he even goes so far as to affirm that it never exists, after the fifteenth year, without pulmonary consumption. This, however, is not true. It is but recently that I examined the body of a man, aged thirty, who died of psoas abscess, in whom, although the lungs were perfectly sound, the lumbar, pelvic, and mesenteric glands were most extensively tuberculized. Nor is this the only instance which I have seen of this disease unconnected with pulmonary phthisis.

The deposition of tubercular matter is much more common in the bronchial glands than in any other. In 100 children, in which these organs were carefully inspected, Dr. Lombard found them affected in 87. Age seems to exert a considerable influence in respect to the frequency of this deposition in different parts of the system. In adults, the mesenteric glands are more commonly affected. In 100 phthisical subjects, Louis found these bodies tuberculized in 23, or in the proportion nearly of one to four. When suffering under this disease, the glands exhibit different appearances, according to the progress it may have made. Generally speaking, they are enlarged in their size, of a dense gristly texture, white externally, and of a light rosy tint internally, either uniformly, in streaks, or in patches. The tubercular matter itself is of a singularly yellowish color, especially if it has existed for some length of time, and often contains particles of curdy pus.

Fig. 77.



Cretaceous degeneration of the lymphatic glands.

9. Finally, the lymphatic glands are occasionally *ossified*, as in Fig. 77, and still more frequently they are transformed into a soft whitish substance, like chalk. These changes most commonly occur in the conglobate glands at the root of the lungs, in persons cut off by pulmonary phthisis; but sometimes they are witnessed in other situations, as in the groin, mesentery, and pelvis. Not long ago, I met with a case in which a considerable number of the absorbent glands of the neck were ossified. They were perfectly hard, like bone, of a light brownish color, irregularly rounded, and from the size of a pea to that of a hazel-nut. Occasionally the lesion seems to be confined entirely to the cellulo-fibrous envelop of these bodies, their parenchymatous structure either remaining sound, or else containing tubercular or calcareous matter. In the bronchial glands, it is not unusual to find hard sabulous concretions, matted together by cellular tissue; similar substances, only of a more regular shape, I have several times seen in the lumbar and pelvic glands. In most of the cases which have come under my notice they were perfectly spherical, smooth, uniformly hard, and very few of them larger than a currant; they occurred in the midst of the parenchymatous texture, to which they adhered by dense cellular tissue, and which was, in other respects, entirely natural.

These morbid changes may be considered as resulting from a slow chronic inflammation, similar to that which accompanies ossific deposition in the arteries. Ordinarily, the metamorphosis begins at one or more points, whence it gradually spreads in different directions, until it embraces the whole gland. When purely ossific, it is supposed by some to be preceded by cartilage, but this admits of doubt.

# CHAPTER VIII.

## JOINTS.

I. *Articular Cartilages.*—Lesions.—Reparation.—Inflammation.—Softening.—Suppuration.—Ulceration.—Ossification.—II. *Synovial Membranes.*—Diseases: Inflammation.—Effusion of Lymph and Pus.—Ulceration.—Chronic Irritation.—Loose Cartilages.—Chalky Concretions.—III. *Ligaments.*—Adhesive Inflammation.—Atrophy.—Calcareous Concretions.

## SECTION I.

### ARTICULAR CARTILAGES.

CARTILAGES, both articular and non-articular, are susceptible of reparation, inflammation, suppuration, softening, ulceration, and ossification.

1. When divided by a sharp instrument, or torn asunder, as in fractures, cartilages readily unite, the edges of the *wound* being at first rounded off, and afterwards joined by a dense fibro-ligamentous substance, whiter and more opaque than the original structure. In some instances, the reparation is effected through the medium of osseous matter; but this is rare. In this respect, the articular cartilages differ remarkably from the costal, which, when cut or broken, always unite by bony matter, the reparative process being exactly analogous to that which nature employs in the cicatrization of fracture. The difference in these two cases depends, no doubt, upon some difference of structure, though it is by no means easy to determine why it is that an organ, which naturally contains less earthy matter than another, should, when injured, be more easily united by bone. The reverse, one might suppose, would be the more natural method. Is cartilage ever regenerated? Laennec and Beclard think it is; and careful observations, made since their time, fully authorize us in answering this question affirmatively. The reproduction, however, is generally very imperfect, and serves, therefore, as a very indifferent substitute for the original structure.

2. *Inflammation* of the cartilages may occur as a primary affection; but more generally succeeds to disease of the osseous, synovial, or ligamentous texture. Its progress is usually slow, and its characters are, for the most part, very obscure. In young persons there is sometimes a considerable degree of redness, the vessels of the joint being enlarged and continuous with those of the subjacent bone; but in old subjects this phenomenon is rarely present, the only evidence of the disease being a softened, spongy, and tumid condition of the cartilages.

The inflammation is accompanied by severe pain, deep-seated, and of a dull, aching nature; and is soon followed, if its course be not arrested, by ulceration or destructive mollescence.

3. Genuine *suppuration* of the movable cartilages is seldom, if ever, met with, the purulent matter which is found in the diarthrodial joints being generally poured out by the synovial or bony texture. Pus has been observed in the pubic and sacro-iliac symphyses, but the occurrence is extremely rare. Even in ulceration of this tissue, the formation of purulent fluid is by no means a constant accompaniment.

4. *Softening* of the cartilages seems to be the result commonly of severe inflammatory action, by which their structure is converted into a semi-transparent, pulpy substance, not unlike thick starch. This change, which is sometimes effected with great rapidity, is generally connected with caries of the articular surfaces of the bones, and seems to be somewhat analogous in its character to gangrene of the soft parts.

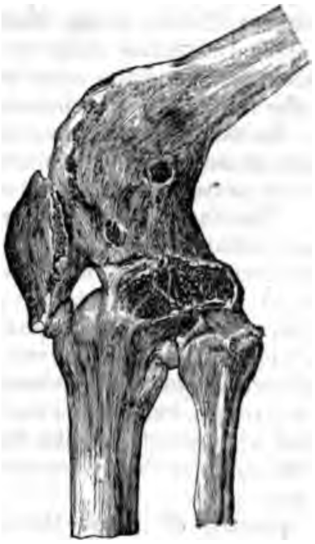
In gouty affections, the articular cartilages of the fingers and toes are often softened and either partially or entirely removed; similar effects are occasionally witnessed in scrofulous disorders of the spinal column, and of the joints of the hip and knee. During the latter stages of utero-gestation, the fibro-cartilaginous substance of the pubic symphysis is sometimes remarkably softened and relaxed, allowing the two contiguous bones to ride upon each other. A case of this kind came under my notice not long since. The lady was in her fifth pregnancy, and the separation, commencing about a month before her lying-in, was so great that she could scarcely walk, or turn in bed, without the greatest suffering. The parts were almost as tender as a boil, and more than five weeks elapsed after her confinement before they regained their healthy character. This affection, which on the whole is rather uncommon in the human subject, seems to be natural to some of the inferior animals, as the rabbit and Guinea-pig, its object, in them, being evidently to facilitate the parturient efforts. An analogous lesion is sometimes observed in the sacro-iliac junction; but the softening and concomitant separation are always much less.

5. *Ulceration* of the cartilages, although it occasionally exists as a primary lesion, in most cases depends upon disease of the adjoining tissues, as caries of the extremities of the bones, or inflammation of the synovial membranes. It may take place at any period of life, or in any articulation; but it is in the hip and knee that it is most generally met with, in persons between twenty and thirty years of age. In general, the disease is confined to a single joint; but occasionally two or three are affected in the same individual, either simultaneously, or in succession. Its causes are referable to local injury, atmospheric vicissitudes, or to a strumous, gouty, or syphilitic taint of the constitution.

Ulcers of the cartilaginous tissue vary much in their size and form. Sometimes they are small and deep, like excavations; more commonly, however, they are superficial, and occupy a pretty large extent of surface. In the primary variety of the disease, in which the erosion always begins towards the centre of the free surface of the cartilage, he ulcer is sometimes smooth, narrow, and of a light grayish color, s if a portion had been scooped out with a knife; but more generally t is broad, irregular, and of a dull yellowish cast, involving a large mount of structure, and extending into the adjacent bone. The edges re often irregular, never elevated or undermined; there are no vessels to be observed, no granulations, frequently no pus; and the synovial membrane either retains its normal characters, or is vascular, paque, and slightly thickened. The primary ulcer often spreads with great rapidity, producing complete denudation of the bones in the ourse of a few weeks. This is especially apt to occur in wounds of he large joints, attended with loss of substance, or the ingress of the tmosphere.

When the ulcers begin in the synovial membrane, or in the articuar extremities of the bones, they are called *secondary*, and always possess certain traits by which they may be distinguished from the preceding. These differences, however, do not consist so much in anything hat relates to the shape, size, or depth of these ulcers, as in the changes which are wrought in the adjoining structures. When the disease depends upon inflammation of the synovial texture, it commonly commences at the circumference of the cartilage, from which it slowly extends towards the centre of the articulation, destroying, as it proceeds, the lining membrane. Should the ulceration, on the other hand, have its origin in the bone, the cartilage will be gradually detached from its connection, partially absorbed, or broken down into a soft, pulpy, gelatinous, or lardaceous mass. This form of the disease is commonly associated with a strumous diathesis, and is most apt to occur in the ileo-femoral articulation of young children.

Fig. 78.



There is a peculiar fibrous condition occasionally observed in the diarthrodial cartilages, apparently the result of incipient ulceration. The cartilage seems to be denuded of synovial membrane, and is everywhere studded with villosities, spicules, or bristles. The affection is most common in old people, and is probably caused by inflammation, attended with slow, ulcerative action, or partial absorption.

6. The cartilages sometimes *ossify*, especially in persons far advanced in life. In the diarthrodial joints this event is rather uncommon, and is witnessed chiefly in disease of the spine, the hip, and knee (Fig. 78). In these situations, the cartilages become not only bony, but are sometimes converted into a substance similar to ivory. The most frequent seat of ossifica-

tion is the sacro-iliac junction, which is so often affected in adults that it is regarded by many as a natural occurrence. Several specimens of this kind are preserved in my private collection. In two of these, the cartilaginous layers are entirely replaced by osseous matter, which has connected the contiguous bones into one common mass.

## SECTION II.

### SYNOVIAL MEMBRANE.

Synovial membrane readily unites when torn or divided, and is highly susceptible of inflammation.

1. All the joints are liable to *inflammation* of their lining membrane, but that of the knee is perhaps more frequently affected than all the others put together. The disease is most apt to occur when the body has attained its full vigor, and may be produced by a great variety of causes, such as external violence, cold, the long-continued use of mercury, gout, rheumatism, or syphilis. The anatomical characters of acute synovitis are, redness, opacity, thickening, and diminished density of the affected membrane, with alteration of secretion, and infiltration of the surrounding cellular substance.

In the early stage of the disease, the redness is commonly very slight, the capillaries being disposed in delicate lines, separated by large intervals. After some time, however, the vessels assume an arborescent form, and the color becomes more intense, occurring either in a uniform manner, or in minute patches, resembling so many ecchymoses. As these changes proceed, the membrane loses its smoothness and transparency, augments slightly in thickness, and becomes so soft that it may be easily scraped off with the finger-nail, or the edge of the scalpel. The natural secretion, which is at first increased in quantity, thin and limpid, is soon rendered thick and turbid, and often contains flakes of lymph. At a more advanced stage, the secretion is entirely changed in its character, being puriform, sero-sanguinolent, or purulent. Occasionally clots of pure blood are contained in the joint; and, in many instances, the free surface of the membrane is covered with minute shreds and globules of lymph, which have the effect of giving it a rough, tomentose aspect. The surrounding cellular tissue is distended with serum, and the vessels penetrating it are engorged with blood, which is so firmly impacted into them that it cannot be easily forced out.

The quantity of lymph thrown out in this disease is sometimes very great, filling up nearly the whole of the affected joint. It is generally of a pale straw color, grayish, or lilac, and often adheres very intimately to the inner surface of the articulation, being spread out in the form of an adventitious membrane. I do not know that vessels have ever been traced into this substance, but that it is susceptible of organization is fully established.

2. *Suppuration* of the synovial membranes is very apt to take place in scrofulous persons, in whom the matter is generally of a thick, flaky character, like that of a psoas abscess. In most cases, the pus is remarkably viscid and ropy, from the admixture of synovial fluid: not unfrequently it is of a dark grumous appearance, and more or less offensive. When the accumulation is small, it may be absorbed, but more commonly it works its way out through the joint by ulceration, and destroys the patient by constitutional irritation.

3. The synovial membranes are liable to *ulceration*. This occurs particularly where they are reflected over the peripheral portions of the joints. The edges of the erosions are always very thin, and their size seldom exceeds that of a ten cent piece. It is difficult to say, in these cases, whether the ulceration begins in the membrane itself, in the subjacent cellular tissue, or in the substance of the cartilage. However this may be, the latter of these textures is always, sooner or later, involved in the process, and in this way small superficial abrasions are often converted into deep cavities.

4. In *chronic synovitis*, in which the vascularity is much less than in the acute, the membrane often presents a remarkably dull, mottled appearance. Its substance is sometimes very much thickened, either by an effusion of sero-albuminous matter into its molecular texture, or by the formation of adventitious membranes; and not unfrequently, especially in cases of long standing, it is converted into a soft pulpy mass, of a light brownish color, intersected by numerous whitish shreds. Cases occur in which the synovial membrane is covered with multitudes of small pendulous excrescences, not unlike warts, melon-seeds, or the epiploic appendages of the large intestine.

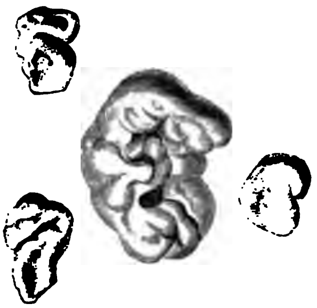
In chronic inflammation the fluid which is thrown out is either thin and glairy, sero-oleaginous, or puriform; rarely purulent. The quantity varies from one to five ounces, and in some rare cases it has been known to amount to more than a quart. This affection, which is distinguished by the term "dropsy," is rarely attended with much pain.

5. The movable joints are liable to the formation of *fibro-cartilaginous osseous concretions*, similar to those occasionally found in the peritoneal and pleuritic cavities. In their size they vary from a mustard-seed to that of a small bean; but they may acquire the volume of a marble, an almond, and even the patella. Their number also varies. Commonly there is only one; occasionally, however, there are three or four, and cases are mentioned where there were as many as eighteen, twenty, twenty-five, and even sixty. Generally of an oval shape, they are sometimes lenticular, spherical, or angular, concave on one side, and convex on the other. They have a whitish pearly appearance, are perfectly smooth and even polished, and consist either of a single mass, or of several lobules, connected together by dense gristly matter. They may be tough and striated, like the ligamentous tissue, or hard, like bone; but in a majority of cases they are distinctly fibro-cartilaginous. When very ancient, they have usually a bony nucleus at the centre. These bodies are invested by a reflection of the synovial mem-

brane, beneath which they are developed, and to which they are originally attached by a slender pedicle, which is ultimately ruptured by the friction of the articular surfaces between which they are situated. The joints most liable to them are the ginglymoid, particularly the knee, elbow, and temporo-maxillary.

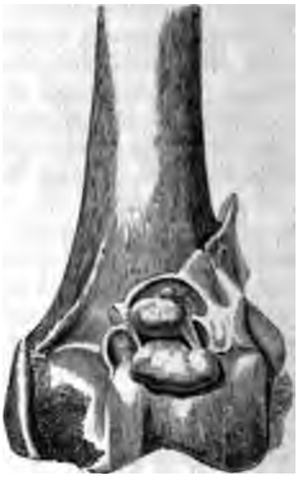
The annexed cut, Fig. 79, affords a good idea of the shape and size of these bodies. It was taken from a collection of thirty-eight osseous concretions kindly presented to me by Dr. John T. Berry, of Uniontown, Kentucky, having been removed by him from the knee-joint of a colored man upwards of thirty-five years of age. They are of a whitish color, rough on the surface, of various configuration, and from the volume of a pea up to that of a pullet's egg. The sac in which they were inclosed extended from the superior border of the patella to the junction of the lower with the inferior third of the thigh, covering half of its entire surface. The next cut, Fig. 80, exhibits these bodies as they lie in the joint attached to the synovial membrane.

Fig. 79.



Loose articular concretions.

Fig. 80.



Attached articular concretions. From a specimen in my collection.

6. The diarthrodial joints are occasionally the seat of gouty concretions, which, from their color and softness, have received the name of *chalk-stones*. They are composed of urate of soda, a peculiar fatty matter, phosphate and carbonate of lime, and a minute quantity of carbonate of magnesia. In an old man, whom I examined some years ago, I found these concretions in nearly all the principal joints of the body, in small amorphous masses, of a whitish color, and of a soft, unctuous consistence. Sometimes they are perfectly smooth and round; more commonly, however, they are rough and irregular, grooved or nodulated. In most cases they are small, though they have been observed of the size of an egg. These bodies are almost always connected with a gouty diathesis.

## SECTION III.

### LIGAMENTS.

THE diseases of the ligaments are few and infrequent, owing, no oubt, to their very imperfect vascular and nervous endowments. The ost important morbid changes are inflammation, atrophy, gouty conetions, and lardaceous degeneration.

When a ligament is cut, it readily unites by adhesive inflammation, e process being exactly analogous to that which occurs in the restotion of a fractured bone. The vessels of the part, becoming enlarged, row out lymph, which forms a capsule around the divided extremities, nd thus keeps them in contact. The same kind of matter is afterards effused between the ends of the ligament; and, in proportion as his becomes organized, and assumes the properties of the original exture, the outer capsule, just referred to, is diminished, until at length t is wholly absorbed, leaving merely a slight cicatrice.

Doubts have been expressed by some writers whether ligaments are usceptible of *inflammation*. That they are occasionally the primary eat of this disease, cannot be denied; that they become often affected econdarily, is equally certain. Dissection has fully established the atter point; and, as respects the former, its existence is daily witnessed in gouty and syphilitic disorders of the joints. When laboring under inflammation, the ligaments generally give rise to the most severe suffering, aggravated during the night, and leading to great constitutional irritation. This is well exemplified in sprains, which are always among the most painful accidents. The physical properties of these textures do not seem to be much altered in the early stages of the inflammation: they retain their white argentine aspect, and here and there may be discovered a straggling capillary. Subsequently, they become more vascular, and their substance is infiltrated with serous, lbuminous, or sero-sanguinolent fluid. If the disease continues its avages, the ligament breaks down into a soft, lardaceous mass, containing white silvery shreds, but no trace of vessels. No pus is secreted during these changes; indeed, it is doubtful whether this fluid is ever deposited by this species of tissue, however much it may be inflamed.

*Atrophy* of the ligaments is sometimes produced by the pressure of n aneurismal tumor, or other morbid growth; but more commonly rises through disease of the surrounding textures. When the muscles of the shoulder or hip are paralyzed, the capsular ligaments of those joints are not unfrequently so much attenuated and relaxed as o allow the bones to slip out of their sockets, and this occasionally in very short period. Similar phenomena are sometimes witnessed in he temporo-maxillary articulation, and in the joints of the fingers and humb. In these situations, indeed, spontaneous dislocations, from trophy of the ligaments, are by no means uncommon.

*Calcareous concretions*, of the same character as those which are deposited within the synovial sacs, are sometimes found in the ligaments. When this matter is very abundant, as it is apt to be in persons of a gouty diathesis, it has a tendency to fret and irritate the ligaments, and to render them highly sensitive, and liable to hypertrophy.

---

## CHAPTER IX.

### OSSEOUS SYSTEM.

I. *Bones.*—Diseases.—Reparation.—Inflammation.—Suppuration.—Ulceration.—Gangrene.—Softening.—Rachitis.—Fragility.—Hypertrophy.—Atrophy.—Hydatids.—Aneurism.—Carcinoma.—Melanosis.—Tubercle.—II. *Periosteum.*—Its Fibrous Structure liable to the same kind of Diseases as the Fibrous Membranes generally.—Hypertrophy.—Ossification.—Is seldom, if ever, affected by the Heterologous Formations.—III. *Medullary Membrane.*—Diseases few, but important.

## SECTION I.

### BONES.

The most important diseases of the bones are the following: inflammation, suppuration, ulceration, gangrene, softening, fragility, hypertrophy, atrophy, hydatids, aneurism, carcinoma, melanosis, and tubercle.

1. *Repair after Fracture.*—The restoration after fracture is effected by adhesive inflammation, analogous, in many respects, to that of the soft parts. The changes which attend it, and which are among the most interesting in the whole range of pathological inquiry, may be referred to four stages, each of which will require separate notice. In the first stage, which extends over a period of about five days, the efforts of nature are altogether of a preparatory character, being limited to the absorption of the blood which was poured out at the moment of the accident. At the expiration of this time, or even before, inflammation sets in; that is, the soft structures around the fracture become hot and vascular, their vessels enlarged and deeply injected, and their cells infiltrated with thick, viscid lymph. The same substance is effused between and around the broken ends, as well as within the medullary canal, and in this manner all the injured parts are temporarily glued together. This substance, which is of a light pink color, and of a soft, gelatinous consistence, is what is named *callus*, the real nature of which was a source of so many disputes among the ancient pathologists. As the restorative process advances, bony matter is gradually deposited upon the surface of the medullary membrane, until, at length, a dense, solid plug is formed, which fills up the internal canal, and holds the fragments together. Whilst these changes are going on in the interior, the matter which has been effused upon the surface of the broken

pieces also experiences important alterations. At first, as was before intimated, it is perfectly soft and gelatinous; but by degrees it becomes firm and elastic, like cartilage, and finally assumes all the properties of real bone. This substance is termed the *provisional callus*. It completely encases the fragments, adhering firmly to their outer surface. The quantity of callus is always in direct proportion to the amount of injury; and hence it is usually greater in an oblique or comminuted fracture than in one that is transverse.

In the third stage, the broken bone itself becomes sensibly changed; the lymph which was effused between the fragments, and which until now experienced little alteration, acquires consistence and firmness; numerous vessels are developed in it, and communicate with those of the surrounding structures; and at length, ossification being completed, the two ends of the broken bone are firmly reunited. The period required to effect these changes, is greatly influenced by the age and constitution of the patient, the plan of treatment, and the nature and seat of the fracture; in general, from six to eight weeks may be said to elapse between their commencement and completion.

In the fourth and last stage, embracing a period of several months, the provisional callus is gradually absorbed, the soft parts resume their natural state, the prominence formed by the new bone diminishes, and the internal osseous plug is wrought into cells and cavities, by which the medullary canal is at last completely re-established.

Thus it appears, as has been already hinted, that the process by which a broken bone is reunited is truly analogous to that which nature adopts in restoring wounds of the soft parts. The only difference seems to consist in the changes which occur in the surrounding parts, and in the formation of the provisional callus. But, in order to render this process effectual, it is necessary that the broken bone should be kept at rest, that it should be provided with a due amount of animal matter, and that the vascular connection between it and the adjacent structures should not be too much interrupted. If these conditions be absent, the restoration will be imperfect, or a false joint will be formed. Fractures of the neck of the thigh bone, the patella, and the olecranon, rarely unite by osseous matter, but in almost all cases through the medium of a white, fibro-ligamentous substance. The causes of this imperfect reproduction consist chiefly in a defect of periosteum, in inefficient nutrition, and in the difficulty which the surgeon experiences in maintaining the fragments in proper apposition. That the union of internal parts greatly depends upon the changes which take place in the surrounding textures, is a fact which has been abundantly verified by observation; and that false joints are often produced by bad and injudicious management is equally true. In the examples, then, before us, it may be supposed that these are the principal, if not the sole agents, which interfere with the restorative process. In the case of the neck of the thigh-bone, the influence of the periosteum in the production of osseous matter is strikingly illustrated by the fact that, if the fracture be seated partly without and partly within the capsular ligament, the former will unite by bone, the latter by fibrous matter.

When a *false joint* is thus formed, the ends of the broken bone are gradually rounded off, and converted into a smooth, secreting surface, which furnishes a thin, oily fluid, not unlike synovia. The surrounding cellular substance is at the same time condensed; and in this manner it is, at length, made to answer the purposes of a capsular ligament.

The newly-formed bone varies considerably in its properties according to the period at which it is examined. In recent cases it always contains a large quantity of animal matter, and is therefore comparatively soft; subsequently, however, it is saturated with earthy salts, and increases greatly in density. In a fractured humerus, one hundred and twenty-eight days after the injury, Dr. Davy found the comparative composition of the shaft and callus to be as follows:—

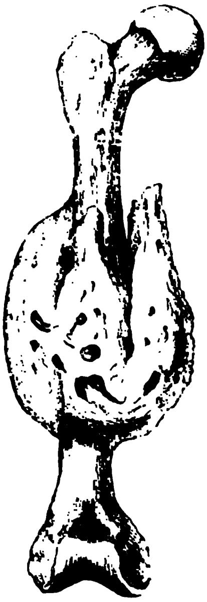
| | Shaft. | Callus. |
|---|---|---|
| Animal matter | 38.60 | 38.8 |
| Earthy salts | 61.40 | 61.2 |

From a specimen where the fracture had occurred long before death, and where the new structures approached the density of ivory, De Claubry obtained the subjoined results:—

| | Original Bone. | Callus. |
|---|---|---|
| Animal matter | 56.284 | 43.795 |
| Carbonate of lime | 3.846 | 9.785 |
| Phosphate of lime | 38.075 | 44.894 |
| Phosphate of magnesia | 1.012 | 1.526 |

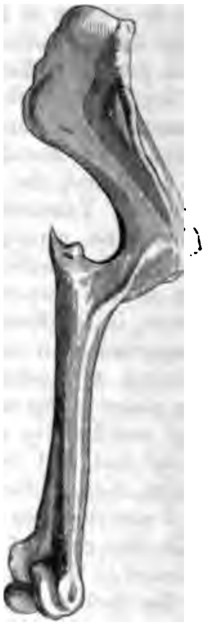
The new matter is sometimes remarkably exuberant, as in Fig. 81,

Fig. 81.



Exuberant callus of a broken femur.

Fig. 82.



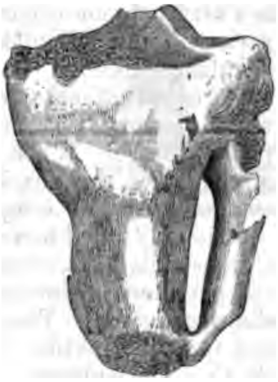
Fracture of the arm-bone of a chicken. From a specimen in my collection.

ecimen in the possession of my friend, Professor Cobb. The hich was oblique, and seated just below the middle of the r, had evidently occurred several years before death. The xceedingly porous in its structure, very brittle, and eleven circumference at the widest part, by six inches in length. pper extremity are detached two processes, which overlap or fragment, and must have considerably impeded the action scles of the limb.

re completely the ends of a broken bone are maintained in e more readily and perfectly, all other things being equal, be reunited. Osseous reparation, however, is not impossible n the separation is unusually great. Fig. 82 is the humerus y, which had been broken near the middle. The union is dense osseous matter, much stronger than the original tex- ugh the distance between the fragments is nearly one inch. men is in my private collection.

ir *after Amputation.*—The changes which are wrought in the of a bone after amputation are not nterest. The edges are gradually ff by the action of the absorbents, atter is deposited by which the end over, and the medullary canal, as ermetically sealed. Fig. 83, from a in my cabinet, affords a good illus- these appearances. The bones, three inches and a half below the connected by a narrow ledge of a kind of exostosis, and coated osseous plate. In some instances s stump is remarkably atrophied ed in size, probably from the con- ure of the artificial leg.

Fig. 83.



Appearances of bony stump after amputation. From a specimen in my collection.

*mmation.*— Osteitis was formerly o be of very rare occurrence; there to believe, however, that it is not uent malady, but that it is present, rm or other, in almost every affection of the osseous tissue, rimary or secondary. The bones most commonly affected are he extremities, especially the tibia, which, from its exposed nd consequent liability to injury, seems to be particularly t. The inflammation may be primarily seated in the osseous or it may be propagated to it from the soft parts: in either eriosteum and medullary membrane are apt, sooner or later, implicated in the disorder. The malady is generally slow in s, and hence a considerable period often elapses before there preciable alterations of tissue. At first, the bone is simply but, in a short time, it loses its density, becomes infiltrated sanguinolent fluid, and assumes a bright reddish hue, the being very numerous, turgid, and distinct. As the disease the osseous fibres separate from each other, and the widened intervals are filled with a soft gelatinous substance, mixed with which it is not unusual to find small clots of blood. These changes are generally attended by an absorption of earthy matter, which has the effect of rendering the bone soft and spongy, at the same time that it causes an actual diminution of weight. This, however, is not an invariable phenomenon, since cases occasionally occur where the phosphate and carbonate of lime are deposited in inordinate quantity, by which the osseous tissue is made preternaturally brittle. When the inflammation is superficial, it usually extends, as was before remarked, to the periosteum, which becomes hot, red, and swollen; in a word, manifests all the signs of ordinary inflammation. When the medullary membrane is implicated, it becomes bloodshot, and the adipose matter is either rapidly absorbed, or it is transformed into a soft diffluent mass, of a light reddish color, and of a peculiarly offensive odor. When the ossific inflammation is fully established, the engorged capillary vessels refuse to receive injecting matter, and can be drained of their contents only after protracted maceration. Osteitis may terminate in resolution, suppuration, ulceration, or gangrene.

4. *Suppuration.*—Suppuration of the external substance of the bones is a very common occurrence; but, as it is ordinarily complicated with periostitis, it is difficult to determine which structure is the source of the purulent secretion. It is most frequently observed in connection with some constitutional taint, such as scrofula, syphilis, or the protracted use of mercury; but it may, and very often does, exist as a purely idiopathic disease. When suppuration takes place in the spongy texture of the bones, the pus is sometimes contained in a delicate vascular cyst, composed of coagulating lymph. Several such collections are occasionally found in a single bone. Thus, in the upper extremity of a carious tibia I discovered three distinct abscesses, the largest of which did not exceed a common almond, whilst the smallest was scarcely of the size of a pea. They were lined each by a soft, vascular membrane, and the bony texture in the neighborhood was unnaturally hard and white. The subject was a female, forty-five years old, who finally died of pulmonary phthisis. Abscesses of this kind seldom attain any considerable magnitude: their contents are dark-colored, thin, and offensive; and, if seated near the extremity of the bone, the matter usually manifests a tendency to work its way into the contiguous joint.

In abscess the bone is sometimes expanded into an immense shell, capable of holding several ounces, and constituting what was formerly called *spina ventosa.* Fig. 84 represents this appearance in a striking degree.

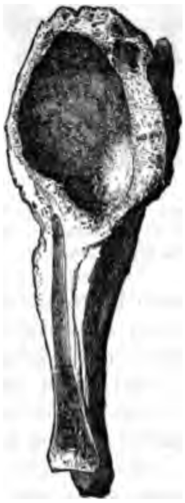
5. *Ulceration.*—Ulceration of the osseous tissue is most generally met with in young persons, being rarely observed in the adult or very aged. The disease, which is usually known under the name of *caries*, is precisely analogous to ulceration of the soft parts, the most prominent feature of each being a loss of substance through molecular disintegration. It is always preceded, as well as accompanied, by inflammatory action, and may be owing either to local injury or to constitutional

causes, such as syphilis, scurvy, scrofula, or deficient nutrition. It may also result from the pressure of aneurismal tumors, or from the spread of malignant ulcers in the soft parts.

Every part of the osseous system is liable to caries; but the pieces most frequently attacked are those which form the walls of the thorax and pelvis, the bones of the tarsus and carpus, the bones of the spine, and the heads of the cylindrical bones of the extremities, especially the lower.

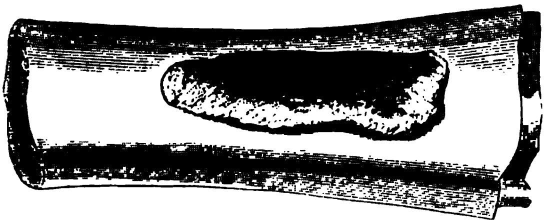
Caries often goes on for a considerable period without ulceration of the soft parts; and, in such cases, the diagnosis is usually difficult. In the majority of instances, however, the nature of the complaint is indicated by the dull aching pain, the tenderness on pressure, and the red, inflammatory state of the skin. After some time, the superincumbent parts become loose and boggy, and at length one or more apertures appear in them, giving vent to a very fetid, dark-colored, or grayish sanies, Fig. 85. The bone which is thus exposed has a foul and eroded aspect, its texture being softened, and infiltrated with a thin brownish fluid, mixed with blood, or with a yellowish, ropy substance, not unlike ill elaborated pus. The ulcers may occupy quite a considerable extent of surface; but, in most cases, they are small, and of a rounded or oval shape. Their edges are steep, elevated, or abrupt, while their bottom is generally studded with small osseous points, which have the effect of making it rough and irregular. The erosions have sometimes a very great depth, and in the broad bones it is not uncommon to see them involve both tables, giving them thus a singularly cribriform appearance. Occasionally they have a sinuous arrangement, the affected surface bearing a close resemblance to the bark of a worm-eaten tree. The osseous texture in the immediate neighborhood of these ulcers is always in a state of inflammation; and the

Fig. 84.



Chronic abscess of the tibia—of large size. Bone much thickened as well as expanded round the cavity.

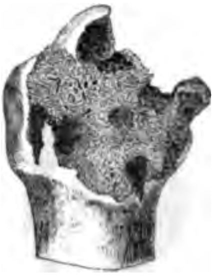
Fig. 85.



Caries of the tibia, showing ulcer in the skin. From a specimen in my collection.

same may be said of the periosteum, which is either red and thickened, greatly indurated, or converted into fibro-cartilage. Cases occur, in which the osseous tissue, although slightly softened, is in reality very porous and brittle, owing to an inordinate deposition of earthy matter. This form of the disease, which seems to affect only the broad bones, is generally attended with little discharge, and hence the ancients were in the habit of calling it "dry caries." Fig. 86 shows the effects of this disease as it occurs in the cancellated structure of the head of the humerus, which I exsected for the relief of the patient.

Fig. 86.



Caries of the head of the humerus. From a preparation in my collection.

The matter which attends ulceration of the osseous tissue is commonly of a thin, watery, ichorous nature, highly irritating to the soft parts, and of an offensive odor. It always contains a large amount of earthy salts, on which account the instruments used in dressing a sore of this kind are usually stained black, especially if made of silver. When granulations sprout up, as is always the case when the ulcer manifests a disposition to heal, the matter becomes less acrid, more copious and consistent, assuming, as the recuperative process advances, all the properties of laudable pus.

6. *Gangrene.*—Gangrene may show itself at any period; but, in the generality of cases, it comes on between the fifth and the twentieth year, seldom before, and still more rarely after. The parts of the osseous system most frequently affected are the tibia, clavicle, inferior maxilla, femur, ulna, radius, and fibula, though no bone in the body is, perhaps, entirely exempt from it.

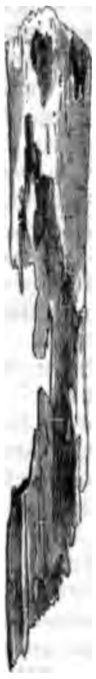
Necrosis may be partial or complete, simple or compound; that is, it may affect merely a part of a bone, or it may pervade its whole structure; again, it may be limited to one bone, or it may attack several pieces simultaneously, or several different parts of the same bone. The causes of the complaint are either local or general, and are not essentially different from those which lead to gangrene in the soft textures. Among the local causes may be enumerated wounds, contusions, fractures, and chemical irritants; among the internal, a scrofulous or venereal taint of the system, the long-continued use of mercury, and the effects of protracted and debilitating febrile diseases. But the most frequent source, perhaps, of all is exposure to cold.

It has been stated that necrosis is sometimes partial, or, in other words, limited to a part of a bone. In such cases, death usually arises from external causes, as a blow, contusion, or denudation, and rarely extends beyond the outer compact structure. Exfoliation is not a necessary consequence of a bone that is stripped of its periosteum. If it be in other respects healthy, and enjoy a vigorous circulation, granulations will spring up and gradually repair the breach. If the denudation, however, be very extensive, even although the bone should be perfectly sound, exfoliation will be very apt to take place, owing to the injury which has been inflicted upon the capillary vessels ırt. The exposed part, supposing that the disease has been d by a removal of the periosteum, remains white and dry, some time exfoliates, or comes away in thin scales, plates, or The surface from which the separation has been effected is with florid granulations, which by degrees assume the ossific ınd thus finally replace, in part or entirely, the lost substance. lliated bone is either white, grayish, or of a light brownish ıgh, often very porous, and so brittle as to fall to pieces under est pressure of the finger. No vessels can be perceived in e animal matter seems to be almost wholly abstracted. By n, its dark color gradually disappears; and by immersion in tric or muriatic acid for a few days, its texture is completely p, and converted into soft, gritty particles.

necrosis pervades the whole thickness of a bone, as it is apt en it follows caries, exposure to cold, smallpox, or measles, ss of separation is much more complex and tedious, months psing between the death of the part and its final exit from . The first step in the process is the formation of a sort of hell, which is evidently designed to answer as a temporary for the old bone, at the same time that it serves to isolate it surrounding parts. Let us inquire how this is effected; how which has so greatly suffered is repaired?

bone acting as an irritant or an extraneous ites inflammation in the circumjacent struc- ich become thickened and pour out coagu- mph, similar to that which is effused around mities of a fracture. After some time, vary- ding to the age and vigor of the patient, this acquires the properties of cartilage, and this, its turn, is finally replaced by osseous matter, in the form of an irregular shell, from one ines in thickness. In this shell one or more metimes as many as eight or ten—technically *oacæ*, and of a rounded or oval shape, are left, nmunicate with the surface of the limb, and channels through which the dead bone, now e *sequester*, is ultimately expelled. The period his takes place varies from six or eight weeks twelve months. Fig. 87 is a rather common equester of the tibia; the spongy structure is destroyed, and the compact is remarkably firm.

Fig. 87.



Necrosis of the thigh bone. From a preparation in my cabinet.

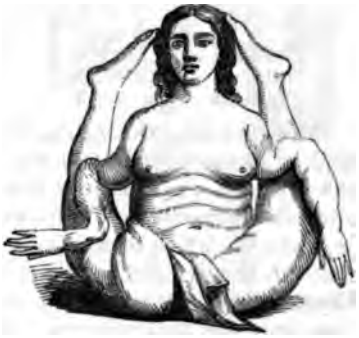
quester is of the same nature precisely as an slough of the soft parts. It is a dead effete , which must be expelled by ulcerative ac- s long as it is retained it produces more or tion in the parts with which it is in contact, thed in thin, fetid, sanious matter, or in ite, inodorous pus. Its surface is usually xcavated, spiculated, or honey-combed; its color grayish, brownish, or black. In the cylindrical bones it is almost always dense and dry; in the short, porous, moist, brittle, and easily crumbled.

It has been generally supposed that the sequester, during its sojourn among the living tissues, is more or less diminished in size and weight by the agency of the absorbents. The experiments, however, of Mr. Gulliver throw some doubt upon the correctness of this opinion, if, indeed, they do not wholly disprove it. Pieces of bone, carefully weighed before and after exposure, were confined on suppurating surfaces, inserted in the medullary canal, or worn as setons in the subcutaneous cellular tissue, and kept there for months, and in one instance for more than a year, without undergoing the slightest alteration in any respect. A paper, detailing nineteen experiments of this kind, is published in the twenty-first volume of the *London Medico-Chirurgical Transactions.*

As soon as the sequester is removed, whether by nature or art, the temporary shell contracts, and by degrees assumes the form of the old bone which it is designed to replace. Whilst this change is going on externally, osseous matter is deposited upon the inner surface of the shell, as well as upon the extremities of the surviving portions, and in this manner the vacant cavity is finally filled up, the time required being always in proportion to the size of the eschar. The medullary canal, if there was one, is seldom re-established; and the new bone, although it remains for a long period highly vascular, is not able to withstand the effects of inflammation so well as the original.

Are bones ever completely regenerated? Respecting this occurrence various opinions have been expressed by pathologists, some denying, others strenuously contending for, the possibility of it. The question, it is obvious, can only be decided by observation; and, if this be taken as our guide, few writers will be able to determine the matter for themselves. Here, as in many other obscure points in pathology, a candid appeal to facts, as they have been recorded by pathologists, will do infinitely more than a thousand conjectures. The testimony of the older writers, unfortunately, is of little avail, as they were in the habit, too frequently, of distorting facts to suit their own theories. The same objection lies against some of the moderns; still there are many exceptions, and from these we must draw our information. All parts of the skeleton do not seem to be equally capable of reproduction. The short and broad bones are much more rarely regenerated than the long; and among the latter the occurrence has been much oftener witnessed in the tibia than in any other of the cylindrical pieces. Moreau saw a case of complete regeneration of the clavicle; Chopart, of the scapula; Fowles, of the ulna; and Weidemann, of the lower-jaw. In 1832, I had an opportunity of seeing an Irish lad, from whom Dr. Cusack, of Dublin, had, four years previously, removed the left half of the inferior maxilla, on account of an osteo-sarcomatous affection. In this case, nature had made an attempt at reproduction, though it was still imperfect at the time I made the examination, the part being replaced by a thick, rounded piece of cartilage, sufficiently strong, however, to subserve the ordinary purposes f mastication. Not long ago, a young man showed me the upper alf of his astragalus, which had sloughed away several years before; ut he had the perfect use of his ankle int, which can only be explained n the ground of a perfect reproducon of the necrosed bone. At the me I saw him, the ulna of the left rm was in a state of gangrenous inammation. No doubt, it seems to e, can therefore be entertained, repecting the possibility of bones being egenerated.

Fig. 88.



Madame Supiot; in a posture quite practicable in the advanced stage of the disease.

7. *Softening.*—Softening of the ones, more frequent in the female an in the male, occurs almost exlusively in adults, and has been nown, in a few instances, to involve the whole skeleton. Of this, e case of Madame Supiot, Fig. 88, described in the *Memoirs of the Royal Academy of Paris*, affords a memorable example, all her bones eing so soft that they could be bent like wax, and put in almost any osition. More generally, however, the lesion is confined to partiular bones, being especially apt to occur in such as are largely supplied with spongy matter.

The osseous tissue in this affection loses its firmness and consistence, ecomes soft and pliant, and may be easily cut with the knife. It is f a pale reddish color, often inclining to yellow, is specifically lighter an the healthy structure, and is infiltrated with a turbid, viscid serum, emovable by pressure. Occasionally, the osseous fibres are widely eparated from each other, so as to leave large cells, which are filled ith a bloody-looking, adipose substance. When this is the case, the one is sometimes remarkably pliant, bending like semi-concrete wax. Boiling completely dissolves it; and exposure to the air, by abstractng its moisture, diminishes its weight. Such are the principal changes bservable in the osseous tissue. The periosteum over the affected art is pale and extenuated; the marrow is converted into a reddish, reasy sanies; and the medullary membrane is wasted down to a few oft, cellular shreds.

The softening generally involves the whole thickness of the bone; ut cases occur in which the outer table remains unchanged, consisting f a thin, brittle shell. The disorder obviously consists either in an nordinate absorption of the phosphate of lime, upon which the solidity f the osseous structure depends, or in a deficient deposition of this matter into its meshes. It has been already mentioned that the bones ecome specifically lighter in this disease; and Dr. Bostock has asertained the additional fact that they contain nearly eighty parts of nimal substance in the hundred. The experiments of this gentleman were afterwards confirmed by those of Dr. G. O. Rees, of London,[1] who, from a careful analysis of three diseased specimens, taken from the same adult subject, obtained the following results, which he has compared with those furnished by healthy bones:—

---

[1] Guy's Hospital Reports, No. viii. p. 191, April, 1839.

| | Diseased. | | Healthy. | |
|---|---|---|---|---|
| | Earths. | Animal matter. | Earths. | Animal matter. |
| Fibula . . | 32.50 | 67.50 | 60.02 | 39.98 |
| Rib . . | 30.00 | 70.00 | 57.49 | 42.51 |
| Vertebra . . | 26.13 | 73.87 | 57.42 | 42.58 |

On examining this table, it will be observed that, in the diseased as well as in the sound state, the fibula contains more earthy matter than the rib, and the rib more than the vertebra. In health, the vertebra and rib approach very nearly in their proportions of animal and saline ingredients, while in softening a considerable difference exists between them in this respect. The causes of this change are not understood. Does it depend upon inflammation? All the phenomena of this affection indicate that it does. If we compare the anatomical characters of osteitis and softening, we shall see that they strikingly resemble each other. I do not, by this, wish to be understood to mean that softening is caused by active inflammation; all I contend for is that the disease in question is the result of a slow chronic irritation, leading to lesion of nutrition in the osseous tissue. It is seldom that this disorder is attended with any pain; and this may be regarded as another argument in favor of the opinion that it does not depend upon acute inflammation.

8. *Rachitis.*—Rachitis differs from softening of the bones, properly so called, in two important particulars; first, it is peculiar to very early life, and secondly, the osseous matter, instead of being absorbed as it is in the latter disease, is not deposited in sufficient quantity originally. In both the result is the same. The affection is occasionally congenital, and sometimes, though rarely, it takes place after puberty. Of 346 cases examined by Guerin,[1] three occurred before birth, ninety-eight during the first year, one hundred and seventy-six during the second, thirty-five during the third year, nineteen during the fourth, ten during the fifth year, and five from the sixth to the twelfth. Of these cases, 198 were females, and the remainder, or less than one-half, males.

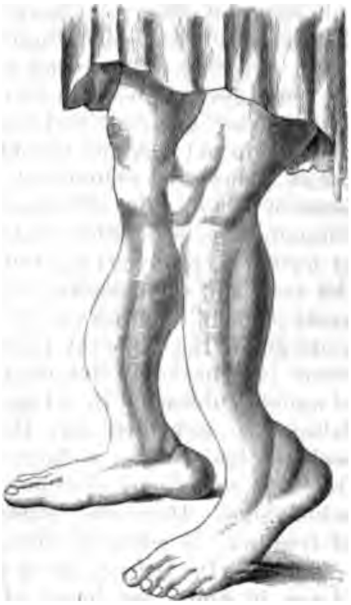
The bones of rickety subjects are remarkably soft, spongy, sectile, and compressible; of a pink, red, or brownish color, and considerably lighter than in the natural state. They are pervaded by a great number of enlarged vessels, and saturated with a thin, sanious fluid, a considerable quantity of which is also effused upon their outer surface and into the medullary canal. The walls of the long bones are rarefied and attenuated, while those of the flat bones are more or less expanded, reticulated, and elastic. The marrow is entirely destitute of its natural properties, and the periosteum is thickened, spongy, and deeply injected. The discolored fluid, so abundantly deposited at this early period of the disease, is gradually replaced by a sort of gelatiniform substance, which becomes organized and vascular, and finally adheres with great firmness to the parts with which it lies in contact.

---

[1] Memoir on Rachitis, translated by Dr. Colescott, in West. Journ. Med. and Surg., Jan., 1841.

In the second stage, a peculiar spongoid substance is formed be- ween the periosteum and the outer urface of the bones; it is from two o three lines, or upwards, in thick- ess, and often presses so much upon he walls of the compact tissue as to orce them in towards the medullary anal, which, in consequence, is con- iderably reduced in size, if not en- irely obliterated. Simultaneously ith these changes the bones are ren- ered so soft that they may be easily ut, bent, and indented with the fin- er.

Fig. 89.



Rickets. From a patient at the Blockley Hospital.

In the third stage—that of reso- ution—the newly-formed substance cquires a firm, dense, compact tex- ure, and is gradually identified with he pre-existing tissues, which at the ame time regain their primitive so- idity. Owing to the presence of this atter, the bones are much larger han in the natural state, and their onsistence, especially in the adult, is early equal to that of ivory.

The cause of rickets is not ascer- ained. The most ingenious conjec- ure regarding it is that which ascribes it to a deficiency of phos- hate of lime, upon which, as is well known, depends the firmness of he osseous tissue. The probability is that the fault resides both in he blood and in the solids. Its origin appears to be occasionally con- ected with syphilis, scrofula, scurvy, and difficult dentition. From he circumstance of its being sometimes witnessed in several children f the same family, it has by many been considered as hereditary. In the earlier stages of the disease, when the bones are soft, and consequently unable to support the weight of the body, or to resist the action of the muscles, there is always more or less deformity, which seldom, if ever, wholly disappears in after life.

9. *Induration.*—The osseous tissue, like the soft parts, is subject to induration. The lesion is a natural concomitant of the third stage of rachitis, and is not unfrequently witnessed in the cranial bones, in exostoses, and in old fractures. It may occur at any period of life, but is most common in advanced age, and may affect, either separately or conjointly, both the spongy and the compact substance. The induration varies in degree from the slightest increase of the natural consistence to a state approaching that of ivory. Hence the term *eburnation* is sometimes applied to it. It is characterized by a remarkable closeness of the osseous tissues, the cells of which are filled with inorganic matter, without any evident morbid condition. The affected bone may retain its natural size, but in general it is somewhat in-

creased; in a small proportion of cases it is sensibly diminished. Its weight is usually augmented, its form more or less changed, and its density so great that it is exceedingly difficult to break or saw it. In this respect it offers a striking contrast to fragility of the osseous tissue. The cause of this transformation is quite unknown.

10. *Fragility.*—The bones are liable to become preternaturally brittle, crumbling to pieces under the most trifling accidents. The disease, which is technically called fragility, is most commonly found as an attendant on old age, and is seldom restricted to any particular class of bones, though the cylindrical are perhaps the most prone to it. The cause of this singular affection has been a source of much theoretical discussion. The best pathologists, however, agree in referring it to a lesion of nutrition, produced by a diminution of the number and volume of the vessels of the osseous tissue. The validity of this opinion derives great plausibility from a contemplation of the changes which the bones undergo in the different periods of life. In childhood, the osseous tissue is remarkably flexible and pliant, and contains a large amount of animal substance; in old age, on the contrary, it is very dense, hard, calcareous, and extremely liable to break, the slightest exertion or accident being often sufficient to cause this result. The number of fractures sometimes produced in this way, even in young persons, is astonishing. Devergie dissected a female who died under symptoms of fragility, in whose skeleton he found not less than eighty-three fractures. Dr. Gibson[1] gives the case of a young man, nineteen years of age, in whom the bones of the arm, forearm, thigh and leg, have all been repeatedly broken, from the most trivial causes. The clavicles have suffered still more frequently, having been fractured eight times. Fractures from this cause sometimes occur in the fœtus in the womb. Chaussier has related a remarkable example of this kind in which each of the long bones presented one or more of these lesions, some of which were recent, some were beginning to unite, and some were consolidated. The child survived its birth only twenty-four hours.

Bones affected with this disease are sometimes so completely saturated with oily matter as to render them unfit for preparations; but, in general, they are dry and brittle, and crumble to pieces under the slightest pressure. In the latter stages of scurvy and scrofula, they often become extremely fragile; and, if they be boiled, they break down into thin, irregular scales, or are almost entirely dissolved. The disease is rarely attended with pain, and the general health is usually remarkably good. When fractures occur, they sometimes rapidly unite; at other times, however, restoration does not take place, or only after a very long period.

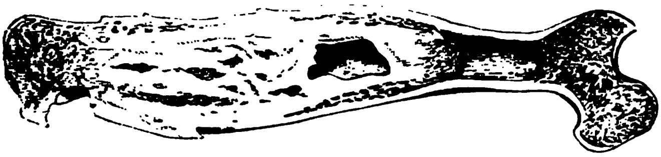
11. *Hypertrophy.*—Hypertrophy of the osseous tissue may be partial or general; that is, the abnormal growth may affect either a portion or the whole of a bone. The latter, however, is a very rare occurrence, though perhaps not so much so as has been imagined. Cases, indeed, not unfrequently occur, in which the broad bones of the

---

[1] Institutes of Surgery, fifth edition, vol. i. p. 233.

l present an extraordinary degree of development, being more
ı an inch in thickness, and so hard that it is almost impossible
aw them. Under these circumstances, the two tables are ex-
ıely compact, the intermediate spongy structure being totally obli-
ted, or, rather, replaced by dense earthy matter. Similar appear-
s are sometimes witnessed in the cylindrical bones of the extremi-
In an old femur in my private collection, the medullary canal is
cely large enough to admit a common-sized quill; the whole shaft
ists almost entirely of compact substance, in many places more
ı six lines in thickness. The bones of the male are always larger
more distinctly developed than those of the female; and the bones
ersons who take much exercise, than those who are indolent, or
e little exertion. By labor, their weight and dimensions increase;
r spongy structure diminishes, whilst the compact becomes harder,
closer grain, and acquires an almost rock-like solidity; the mus-
r prominences are rendered more conspicuous;—in short, every-
g indicates that they are in a state of general hypertrophy. When
ı circumstanced, the osseous tissue usually contains a due propor-
of animal matter; and hence it is always capable of resisting, in
ry eminent degree, the influence of such agents as have a tendency
ıjure it.
he adjoining cuts are excellent representations of general hyper-

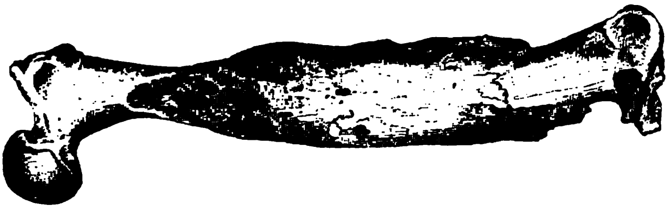
Fig. 90.



General hypertrophy—internal structure. From a preparation in my cabinet.

hy of the femur of a man affected with tertiary syphilis. Fig. 90
section of the bone exhibiting its interior structure, which is very
h condensed throughout, except at the superior extremity, where

Fig. 91.

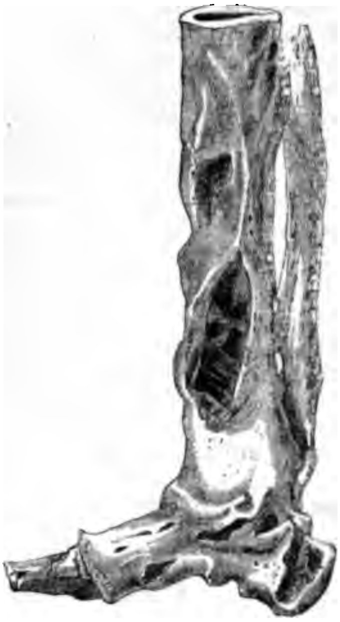


General hypertrophy—external characters.

e are still some remains of the areolar tissue; the medullary canal
ntirely obliterated, and the weight of the bone is nearly twice as
t as in health. Fig. 91 shows the external appearance of the
e. The drawings are from a specimen in my cabinet.

The adjoining sketch (Fig. 92) is a specimen of hypertrophy of the bones of the leg and foot, both in thickness and length. It is from a drawing by Mr. Heiman, of a preparation in the collection of Professor Buchanan, of Nashville. All the bones are much enlarged, increased in weight, and anchylosed at the ankle, tarsal, and metatarsal joints. The interosseous ligament was completely ossified. The foot and leg had been the seat of extensive ulceration, followed by exfoliation from the hypertrophied bones.

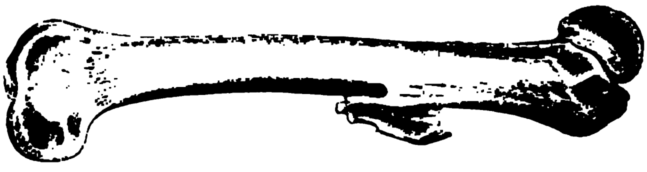
Fig. 92.



Hypertrophy involving both the thickness and length of the bones.

When the hypertrophy is partial, it constitutes what is called an *exostosis*, an exuberant growth of bony matter, similar in its structure to the osseous tissue in its normal condition. The bones most commonly affected by this species of hypertrophy are the femoral, frontal, parietal, and lower maxillary, the relative frequency of its attack being in the order here stated. No part of the skeleton, however, is exempt from it; and, in a few instances, it has been known to affect a large number of pieces at the same time, as if there had been an exostotic diathesis. Great variety prevails in regard to the size and shape of these tumors. In general, they look like small, irregular excrescences, with a rough, scabrous surface; but sometimes, especially when they are seated on the flat bones, they are of a spherical form, and nearly or quite smooth. In other cases, again, they have a mammillated appearance; or they form flat disks, resting upon a short, narrow, pedicle; or, finally, they are rounded, nodular, or knob-like. Their size seldom exceeds a small apple, orange, or potato, though examples are occasionally met with where they are as large as a cocoa-nut or a fœtal head. In a specimen in my private collection, the walls of the left maxillary sinus are literally studded with these growths, none of which exceeds a small grain of wheat, which they also very much resemble in shape. Fig. 93, from a specimen in my collection, conveys a good idea of an exostosis of the thigh-bone.

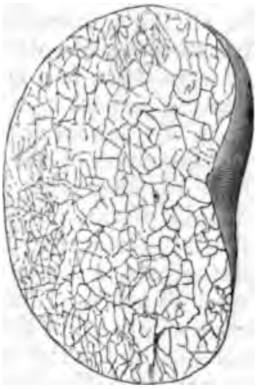
Fig. 93.



Exostosis of the thigh-bone. From a preparation in my collection.

In their structure, exostoses present all the varieties of the natural
ne upon which they grow, being composed of a soft, spongy texture,
losed by a layer of solid, compact matter.
ey may be surrounded by a coat of carti-
ge, or have all the firmness and density of
ory, as in Fig. 94. In the healthy state, they
e perfectly insensible; but they are suscepti-
e of inflammation, and it is probable that,
en laboring under this disease, they experi-
ce those changes which have obtained for
em the names of fungous, medullary, and
ncerous, so much in vogue among surgical
iters.

Fig. 94.



An ivory-like exostosis, showing its internal structure. From a specimen in my collection.

These tumors are formed in the same man-
r as the osseous tissue in other parts of the
eleton, passing always through the same
ges of ossification. That this is the case,
ll appear sufficiently obvious if we refer for
moment to the causes by which they are
oduced. Among these, the most common,
rhaps, are the various kinds of external
olence, such, especially, as blows or contusions; though many con-
nd for a scrofulous, gouty, or syphilitic origin. Induced in any of
ese ways, there must be local inflammation, either in the bone, or
the periosteum, or in both, one of the effects of which is an effu-
on of coagulating lymph. This, after some time, is converted into
rtilage, and this finally into bony matter.

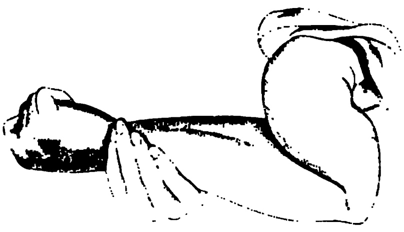
Some exostoses are extremely rapid in their growth, and soon attain
very considerable magnitude; most commonly, however, their deve-
pment is gradual, going on for many years without causing any
rious inconvenience. They are seldom attended with much pain;
deed, it is only when they are very large, or when they degenerate
to cancerous affections, that they become a source of local annoy-
nce and constitutional disturbance. Youth seems to be the period
which these growths are most frequent, though adults and old per-
ns are not exempt from them. An exostosis occasionally separates
pontaneously from its connections.

12. *Atrophy.*—Atrophy of the osseous tissue is characterized by the
rtial absorption of its elementary constituents, as is evinced by its
ghtness and porosity. The lesion may occur in any portion of the
keleton, but the long bones are oftener affected than the short or flat.
ike hypertrophy, it may be partial or general; that is, it may involve
n entire piece, or be limited to a particular part of it. Atrophy,
oreover, may be concentric or eccentric. In the former variety the
one is diminished in its diameter; in the latter, it retains its original
ize, but is reduced in weight, and rarefied in its tissue. The causes
nder the influence of which it may take place are, protracted pres-
re, chronic inflammation, deficient nervous influence, and insufficient
pply of arterial blood.

*a.* That pressure, steadily exerted for a considerable length of time, has a tendency to produce atrophy of the osseous tissue, is familiarly known to pathologists. This is well exemplified in the cranial bones in tumors of the dura mater; in the sternum and dorsal vertebræ in aneurism of the aorta; in the ribs in cancer of the mammary gland. In all these instances the compact substance is reduced to a thin, translucent plate, while the spongy texture is either wholly destroyed, or worn down to a few slender threads. The immediate cause of the wasting process here is absorption, acting simultaneously and equally upon the animal and earthy constituents.

Absorption of the bone is sometimes carried to a great extent after fracture. Nor is the process always limited to the ends of the fragments; instead of this it occasionally affects nearly their whole length. Of the latter occurrence a remarkable case came under my observation last winter in a man named Bowen, a provision merchant of Boston, aged 53 years. When eighteen years old he received two simple fractures of the right humerus, at an interval of three months, one being situated about the middle of the bone, the other an inch and a half higher up. The first was repaired in the usual time, but the second refused to unite, the ends of the fragments becoming rounded off, as in the formation of an artificial joint; the process gradually proceeding, the whole bone was finally absorbed, nothing remaining except its condyles and a little of its head. The period occupied in the absorption was about six years, the general health being all the while unimpaired. The muscles of the arm are well developed, and, when thrown into powerful action, are capable of diminishing the interval between the shoulder and elbow to the extent of several inches. Although the man is unable to perform any of the usual movements of the member, he can readily raise a weight of upwards of one hundred pounds, and can apply his hand to various purposes. The accompanying cut represents the appearance of the limb during the contraction of its muscles.

Fig. 95.

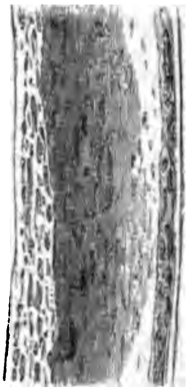


Absorption of the humerus.

*b.* Atrophy from chronic inflammation appears to be infrequent. The best specimen of it that I have seen occurred in a colored woman, who died of pulmonary phthisis at the age of forty. The body was much emaciated, and all the long bones were remarkably reduced in weight, though they had experienced no change in their external configuration. The compact substance was wasted to a mere shell, scarcely thicker than common wrapping paper, and the cells of the spongy texture were increased many times beyond the natural size. The medullary canal was much enlarged, and filled with a greasy, reddish substance, not unlike fresh adipocire. These appearances are well shown in the accompanying cut (Fig. 96), and afford a beautiful illustration of the eccentric form of atrophy.

Atrophy is sometimes the result of local injury, as a blow, wound, tusion. The wasting in this case may be limited to the site of iginal mischief, or it may extend to the entire bone, which, er, is rare. In what manner such an injury es, whether through the agency of inflam- r irritation, or otherwise, in giving rise to y, is unknown.

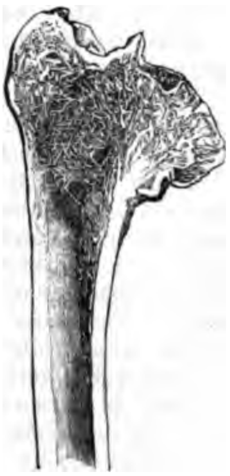
Fig. 96.



eficient nervous influence is a frequent cause ophy both of the osseous tissue and of the rts. In paralysis of the lower extremities, s generally notable wasting, not only of the s, but also of the long bones, which are r reduced in weight, rarefied in their texture, minished in size. Lobstein[1] records a re- ble case of this description, referred to in a us chapter. The man died at the age of fifty- ith extreme atrophy of the right leg, which ed to be consequent upon a fall received when a child, and by which the great nerves of ib were severely injured. All the soft parts xcessively wasted, and the right femur weighed little more than unces, while its fellow weighed nearly double. The nerves and were not perceptibly changed. Where atrophy is produced by nt nervous influence it is generally concentric; that is, the bone ibly diminished in size without any evident alteration in its ex- onfiguration.

he effect of a diminished supply of blood in inducing atrophy of sometimes very conspicuous in old frac- In injuries of this description there n considerable wasting of the osseous in consequence merely of the oblitera- the nutritious artery by the callus. The y is always eccentric, and is usually limited third, one half, or two-thirds of the affect- e, according to the seat of the original in- r, more properly speaking, the quantity new matter, and the extent of the vascu- iteration.

Fig. 97.



Atrophy of cellular structure of the thigh-bone.

nally, there is a species of senile atrophy. age, the bones are rendered light, porous, ittle; the compact substance is reduced to parchment-like shell, while the areolar is remarkably rarefied or expanded; the ar prominences are diminished in size; the matter is partially absorbed; and many vessels are obliterated. These changes here more conspicuous than in the neck emur, which, in consequence, often breaks e most trifling causes, and which, after this occurrence, is seldom, if ever, repaired by osseous matter. Fig. 97 is a section of a well-marked specimen of this kind; the internal structure is very much rarefied; and the head of the bone, flattened and expanded, is approximated to the shaft, from the partial absorption of its neck.

---

[1] Traité d'Anat. Path., t. i. p. 90.

13. *Acephalocysts.*—The bones are occasionally infested by acephalocysts. They are of a globular form, and vary considerably both in number, in size, and in the appearance of their contents. There may be only two or three, or they may exist in much greater number. In size they range between a hemp-seed and a pullet's egg. When young, they are perfectly smooth, transparent, and occupied by a light-colored, serous fluid. They are liable, however, as they increase in age, to become indurated, and to have their contents rendered turbid, viscid, and albuminous.

The portions of the osseous system most subject to these bodies are, the tibia, particularly its superior extremity, the frontal bone, the ilium, the humerus, the spine, and femur. It is very seldom that they exist simultaneously in several pieces of the skeleton. They are usually developed either in the spongy structure, or in the medullary canal, which they distend in every direction, so as to form a chamber several inches in diameter. The parietes of this cavity are generally very thin, and liable to become perforated by ulcerative absorption. The hydatids may be adherent, or they may float about in the serous contents of the osseous cyst.

Sex does not appear to exert any particular influence upon the production of this disease. It is most common in adults, but has been met with in young subjects, and even in children. Its causes have not been satisfactorily investigated; nor are its symptoms such as to enable us, in the present state of our knowledge, to distinguish it from other affections. One of the most singular features of these cysts is their indestructible nature, being almost sure, unless completely destroyed, to be speedily regenerated.

14. *Aneurism.*—Aneurism of the osseous tissue consists in an extraordinary development of the minute vessels, and presents precisely the same anatomical features as aneurism by anastomosis of the soft parts. Confined usually to one bone, it may occur in several, or even in a considerable number. In one case it was discovered in the cranium, sternum, ribs, vertebræ, and innominatum of the same subject. Its favorite seat is the upper extremity of the tibia, just below the knee. It may arise at various periods of life, but is most common in young adults. The tumor varies in volume from a pullet's egg to a cocoa-nut.

The disease always begins in the cancellated structure, which is converted into various sized chambers, filled with coagulated blood, disposed in concentric layers, as in old aneurismal tumors. Some of the cells occasionally contain fluid blood, or blood partly fluid and partly clotted; but this is rare. The outer table of the bone is expanded, attenuated, and perforated, or so soft, flexible, and elastic that it may be bent like cartilage. In some instances, on the other hand, it is remarkably brittle, and may be crushed like the shell of an egg. The periosteum is thickened and indurated; but the joints in the imediate vicinity of the disease are commonly healthy, even when they e separated from it merely by a thin layer of cartilage. The vessels hich ramify through the substance of the bone are tortuous and rittle, increased in size, and open by numerous little orifices into the eurismal sac in the centre of the diseased mass.

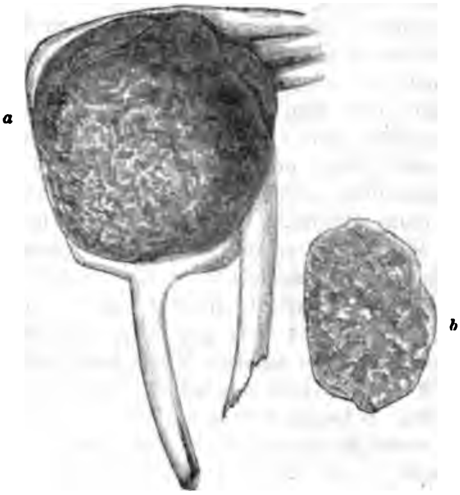
The causes of this lesion are involved in obscurity. In some in-ances it has been traced to the effects of a blow; in others, to a fall r jump from a considerable height. Either of these causes, by dis-urbing the vascular action of the bone, might produce the disease. ccasionally it is connected with a gouty or rheumatic diathesis, and en probably depends upon inflammatory irritation.

15. *Hæmatoid Tumor.*—There is a variety of tumor, closely allied to at just described, which, for the sake of uniformity in medical nomen-lature, I shall term hæmatoid. It is produced by a deposition of blood the cancellated structure, forming a firm, oval, and elastic tumor, lled with dark, solid coagula. The best specimen of this disease that have met with, occurred to me, about ten years ago, in a man aged hirty-five, a portion of whose lower jaw I amputated, on account of hat was supposed to be osteo-sarcoma. The tumor, about the size f a common orange, extended from the canine tooth on the right ide to the middle grinder of the left, and consisted of a mere osseous hell, without any vestige of the cancellated structure; it was occupied y three red, solid coagula, the largest of which did not exceed the olume of a pigeon's egg. The cavity was only partially filled by he clotted blood, which adhered to the inner surface of the bony wall, nd was evidently organized. The tumor had appeared three years efore without any assignable cause. Whence was this blood derived? id it proceed from a rupture of some of the vessels of the bone? If o, the fact could not be ascertained by the most careful examination.

16. *Fibro-cartilaginous Tumor.*—The fibro-cartilaginous tumor, the *nchondroma* of recent writers, may be developed in the cancellated tructure, or upon the outer surface of the bones, beneath the peri-osteum. Its figure is globular; its surface rough, or nodulated; its consistence firm, dense, and elastic; its color white, or grayish. When boiled, it yields a peculiar form of gelatine, termed *chondrin.* The tumor is essentially composed of a fibrous and a cartilaginous sub-stance. The former constitutes the nidus in which the latter is deposited, and consists of a vast number of oblong or rounded cells, from the size of a clover-seed to that of a pea. These cavities cannot generally be distinguished until the cartilaginous element has been scraped away, or removed by maceration. The morbid mass is strikingly conglomerate, and often attains a large bulk. When it originates, s it commonly does, in the central part of the bone, it gradually en-croaches upon the compact tissue, which it expands into a thin, porous shell, either entirely osseous, or partly osseous and partly cartilaginous. Finally, the attenuated lamella gives way at one or more points, and thus allows the morbid growth to protrude beneath the periosteum, which is itself often very much altered in its character.

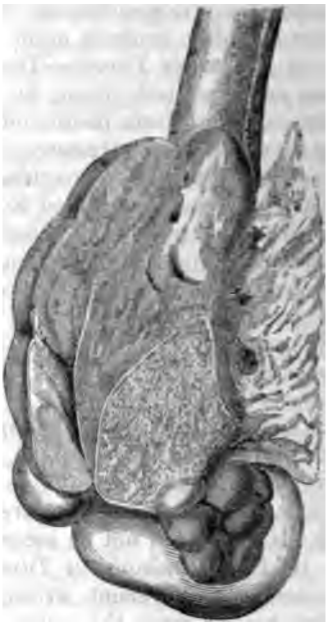
This tumor ordinarily affects only one bone, is not malignant, and is productive of little inconvenience, except from its size. It is peculiar to early life, is often directly chargeable to external violence, manifests no tendency to degeneration, not even when of long standing, is generally slow in its progress, and occasionally appears simultaneously in several parts of the skeleton. Every portion of the osseous system is liable to it; but the pieces most frequently affected are the metacarpal bones, the phalanges of the fingers, the humerus, and the lower jaw. To the tumor now described, especially when it is hard, fibrous, and interspersed with the debris of osseous matter, or red and dense, like half-boiled beef, or fresh pork, the unmeaning title of osteo-sarcoma is usually applied by surgical writers.

Fig. 98.



Enchondromatous tumor of the ribs. *a.* External appearance. *b.* Internal structure. From a specimen in my cabinet.

Fig. 99.



Encephaloid disease of the thigh-bone. From a specimen in my cabinet.

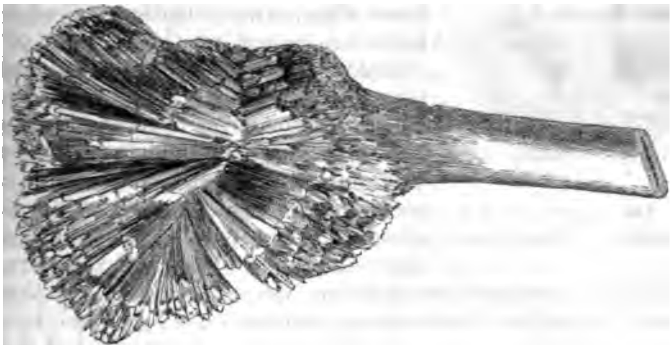
17. *Encephaloid.*—Encephaloid, fungus hæmatodes, or cerebriform cancer, generally, if not invariably, originates in the spongy structure, from which it gradually extends to the compact lamella, and finally to the periosteum. It most commonly attacks the upper and lower jaw, and the long bones of the extremities, particularly the femur, humerus, and digital phalanges. No portion of the skeleton, however, is exempt from it. The most terrific feature of encephaloid is its tendency to recur in some other part of the body, after it has been dislodged from its original situation. It may occur at any period of life, but young persons are most prone to it.

Although encephaloid may occur as an infiltration, it most commonly presents itself in the form of a tumor, arranged in rounded,

lated masses, of the color and consistence of the medullary
ture of the brain. Not unfrequently it contains small cavi-
filled with clotted blood, dirty looking serum, or soft, gelati-
, oily, sebaceous, or melliceroid matter. Occasionally one part of
umor exhibits the brain-like character, while another is strictly
atoid, or composed of a mixture of blood and encephaloid. In
great majority of cases, however, the two substances are pretty
nately blended together. Vessels, sometimes of considerable
me, may be seen ramifying over the surface of the morbid growth,
dipping into its interior. The outer table of the bone is trans-
ed into a thin, parchment-like lamella, perforated in various
es, or entirely destroyed by absorption. A section of the tumor
lly exhibits, in addition to the appearances just described, osseous
nents, or pieces of fibro-cartilage. The superincumbent integu-
ts, traversed by large bluish veins, are at first soft and glossy; but
ngth, from the constant and increasing pressure, they ulcerate, and
the fungous mass to protrude.

me of the more extraordinary alterations which the osseous
ture is capable of undergoing in this disease are well seen in the
xed cut, Fig. 100, from a drawing made for me by Mr. Heiman, of

Fig. 100.



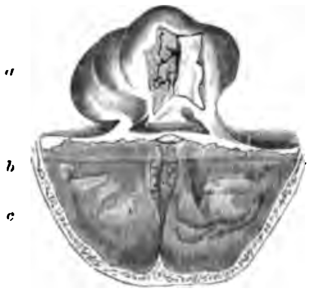
ville, from a specimen in the cabinet of Professor Buchanan of
city. The patient was a mulatto girl, about twelve years of age,
had labored for some time under a large lobulated tumor, partly
ic and partly inelastic, situated in the lower part of the leg, and
ded with great dilatation and distension of the subcutaneous veins.
utation being performed, the stump healed kindly, and for several
s the girl did well; but in a few months she began to complain of
in her hip and side, and she died in less than a year, apparently
internal malignant disease. A section of the tumor displayed an
ense number of osseous spicules, of extraordinary length and deli-
, whose intervals were occupied partly by cartilaginous and partly
elatinous substance, with here and there a cyst containing bloody-
ing matter.

. *Scirrhus.*—Scirrhus of the osseous tissue is singularly rare. It
rs exclusively in old subjects, and is usually concomitant of the

same disease of the breast or some other organ. Generally limited to a single bone, it may affect several pieces simultaneously, and always begins in the cancellated structure. Its favorite seat is the femur, but it may appear in any part of the skeleton, in the short and flat bones, as well as in the long.

The heteroclite matter is deposited under two varieties of form, the infiltrated, and the tuberoid. In the former it is diffused through the areolar tissue, and exhibits the color and consistence of fibro-cartilage, or the rind of fresh pork. In the tuberoid variety the morbid mass is either solitary, or it consists of several agglomerated nodules, from the volume of a hazel-nut to that of an almond. Occasionally three or four distinct tumors are developed simultaneously in the same bone. They are of an irregularly rounded or oval shape, dense and firm in their consistence, and of a greenish, whitish, or yellowish color. The bone is seldom much altered in its size or external configuration, but is liable to be absorbed, and fractured at the seat of the disease.

Fig. 101.



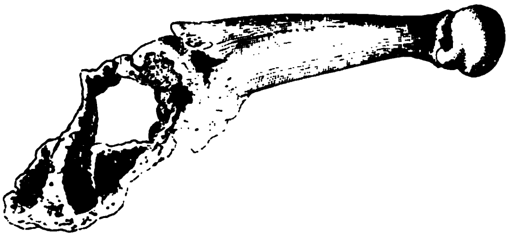
*a*. Colloid tumor. *b*. Ethmoid bone. *c*. Orbitar plate of the frontal bone. From a preparation in my collection.

18. *Colloid.*—Of colloid of the osseous tissue very little is known. It is most frequently met with in the diseased conditions of the bones denominated osteo-sarcoma and spina-ventosa; which are often almost wholly composed of cells and cavities filled with jelly-like matter. The question, however, respecting the identity of these affections can be determined only by future observation. A case in which a colloid tumor grew from the body of the sphenoid bone, outside the dura mater, came under my notice in 1844, in the medical ward at the Louisville Marine Hospital. The patient died at the age of thirty-nine years from epilepsy, produced by a fall twelve months previously. On examination, Dr. Colescott and myself found, in the situation referred to, a lobulated tumor, of irregular form, and about the size of a pullet's egg, which had flattened the Varolian bridge, and evidently induced the disease in question (Fig. 101). A section of the morbid mass showed that it was composed of several compartments communicating with each other, and occupied by a white, semi-concrete substance, in all respects similar to that of colloid.

19. *Melanosis.*—Melanosis of the osseous tissue is exceedingly rare. It may appear in small disseminated masses, nodules, or clusters, or in the form of infiltration. It has been observed in various parts of the skeleton, but is most common in the pieces of the extremities, particularly the femur and tibia. Coexisting generally with melanosis in other organs, it is situated either upon the surface of the bone, beneath the periosteum, in the medullary canal, or in the spongy structure, the latter of which it sometimes dyes of a deep black color. In its progress and mode of termination it closely resembles medullary sarcoma.

20. *Tubercles.*—Tubercles of the bones are much more common than s generally imagined. The bones usually affected are the vertebræ, the short bones of the hand and foot, and the articulating extremities of

Fig. 102.



Tubercular excavation of the cuneiform bone. From a preparation in my collection.

the long bones. The particular seat of tubercles is the spongy texture, though occasionally they are formed upon the outer surface of the bones, between it and the periosteum. Fig. 102 is a good illustration of a tubercular cavity of the internal cuneiform bone of the left foot, which I was obliged to amputate on account of the great extent of the disease.

There are two varieties of form in which this matter is deposited. In one, perhaps the more common, the tubercles are *encysted*, the inclosing membrane, which varies in thickness from a fifth to half a line, being composed of coagulating lymph, very soft at first, but gradually becoming harder and harder, until finally, in some cases, it acquires the character of fibro-cartilage. It is of a dull grayish color, s made up of delicate inelastic fibres, crossing each other in every conceivable direction, and is frequently furnished with small vessels, passing into it from the surrounding structure. The number of tubercles is seldom very great; their size varies from that of a pea to that of a nutmeg; and in most cases they present a yellowish, opaque appearance. When these bodies become softened, the matter will either work its way out, or pass, by a sort of fistulous route, into a neighboring joint, establishing thereby an analogy with pulmonary tubercles opening into the bronchial tubes. Sometimes a spontaneous cure takes place, the heterologous substance being absorbed, and the cyst contracting so as to obliterate its cavity.

In the second variety, the tubercular matter is deposited directly in the cells of the osseous tissue, forming grayish, semi-transparent, opaline patches, from the one-sixth of an inch to an inch in diameter. This infiltration is noticed chiefly in the bodies of the vertebræ, and in the bones of the tarsus, where it is frequently pervaded by numerous vessels, too delicate to be discerned with the naked eye. The bony tissue immediately around is sometimes deeply injected, but seldom otherwise diseased. In this, as in the preceding variety, the tubercular deposit, after having existed for some time, gradually softens, its vascularity disappears, and the cells in which it was contained are filled with earthy matter. This, however, is not always the case; for now and then the ulcerative process continues until the bone is totally destroyed.

## SECTION II.

### PERIOSTEUM.

The morbid relations of the periosteum, although not unlike those of other fibrous textures, are too important to be passed by without some notice. The most common lesion to which this membrane is liable is chronic inflammation, followed by thickening, and a deposit of osseous matter, generally upon the internal surface, but occasionally upon the external. Acute inflammation is also frequently observed, and seldom exists without implicating the subjacent bone.

*Inflammation* arises either spontaneously, from external injury, or from the operation of the syphilitic poison. In the acute form of the disease, the membrane becomes reddened, its vessels are loaded with blood, and its substance is sensibly softened as well as slightly thickened. Its attachment to the bones is also considerably diminished, so that it can be much more easily peeled off, and the cellular substance on its external surface is generally infiltrated with sero-albuminous matter. These changes are frequently observed upon the fragments of a broken bone, and in incised wounds of the muscles, involving the periosteum.

This disease, especially the acute form of it, not unfrequently passes into *suppuration*. This event is more particularly apt to occur in periostitis of the inferior extremity, caused by cold operating upon a strumous constitution, or by the effects of mercury, or the action of the syphilitic virus. In either case, the suppurative process is remarkably tardy, and the pus is rarely of a healthy character, but almost always very thin, bloody, and offensive, with flakes of curdy matter. As the fluid accumulates, the superincumbent integuments assume a red, glossy, and swollen appearance; the part is excessively painful; fluctuation takes place, and the abscess breaks at one or more points, the corresponding portion of the bone being frequently destroyed by ulceration.

Another termination of acute inflammation is *mortification*. When this occurs, the normal appearance of the membrane is lost, being changed to a dirty ash color, whilst its texture is softened, easily torn, and bathed in a foul offensive fluid, having the characteristic gangrenous odor. This termination, it need scarcely be observed, can never take place without the osseous texture participating in it. The best examples of it are witnessed in the periosteum of the alveolar processes of the jaws, from the abuse of mercury, and in that of the tibia from common necrosis. The sloughs, which are always tough and shreddy, are usually thrown off with considerable difficulty, owing to the tardy and imperfect action of the circumjacent structures.

When the periosteum labors under *chronic inflammation*, it is very apt to become thickened from the effusion of plastic lymph. The pertrophy, for so it may be termed, generally occurs in association th induration, and often involves a considerable extent of surface, ming a diffuse, incompressible swelling, partly fibrous, partly car- ginous, and partly osseous. In other cases, the hypertrophy is more cumscribed, and either exhibits the mixed structure just specified, or is entirely bony. These tumors are commonly of slow formation, d they seldom acquire any great bulk. During the progress of their velopment, they are the seat of a constant, deep-seated gnawing pain, ich is most severe at night, when the body becomes warm in bed. ter continuing for an indefinite period they either remain stationary, they gradually disappear by absorption, or they excite suppuration the superimposed textures.

In old people, it is not uncommon to find this membrane *ossified* on its internal surface, or even through its entire substance. When is affected, the periosteum is of a dull drab color, resists the knife, d is with difficulty detached from the bone which it covers, owing the partial incorporation of their tissues. When dried, it exhibits ry much the appearance of an ossified artery. In the extremities, ecially in the thighs, I have frequently seen considerable nodules bone spring from the outer surface of this membrane, so as to en- ach more or less upon the muscles. In their shape, they are, for most part, ovoidal, and in their consistence they often equal the trous portion of the temporal bone. Their color is usually a few ides lighter than that of the osseous texture in the healthy state.

The periosteum has been found affected, in a few rare cases, with *lanosis;* and occasionally, also, with the tubercular deposit. In cinoma of the bones, the membrane is often implicated secondarily, t it is rarely, if ever, the original seat of this formidable malady. a number of dissections which I have made of encephaloid disease the bones and soft parts, I have found the periosteum entirely un- ched, not even thickened or indurated. Hence we may infer that s fibrous lamella possesses an astonishing self-preserving power, ich superior to what is enjoyed by most other tissues.

## SECTION III.

### MEDULLARY MEMBRANE.

Of the diseases of the medullary membrane very little is known. ute inflammation is extremely rare, and is observed principally in ctures of the long bones. The membrane in this form of the lesion umes a reddish tint, and the secretion of fatty matter is not only porarily suspended, but that which existed prior to the occurrence the accident is generally absorbed. In violent cases, pus is effused, d forms an abscess in the interior of the bone. In necrosis, the dullary membrane, corresponding with the affected portion of bone, es its vitality, and is gradually broken up into a dark-colored, oily trilage, of a fetid gangrenous odor.

Of chronic inflammation of this membrane, I recollect a beautiful instance in the tibia and fibula of a man sixty years of age, who died from the effects of a sloughing ulcer, brought on apparently by intemperance. Both bones were in a state of necrosis at their middle; inferiorly they were greatly expanded, but towards the knee they were of the natural dimensions, and contained a red, florid-looking marrow, of preternatural hardness. The discoloration, however, was not uniform, but in distinct patches, varying in diameter from that of a pea to that of a twenty-five cent piece.

The adipose tissue of the bones bears the greatest resemblance to that in other parts of the body, but it is highly probable that it possesses certain modifications of structure, leading to corresponding peculiarities in reference to its diseases. That this is the case I am disposed to believe from the fact that the medullary membrane is not unfrequently the seat of several of the heterologous formations, as the scirrhous and encephaloid, which are never developed in the adeps of the general system. Tubercular matter is also sometimes deposited here; and another argument in favor of this view is founded upon the notable difference in the products of the two tissues, that of the bones being always of a thin, oily nature, and composed principally of elaine, while the other is semi-concrete, and formed mainly of stearine.

# CHAPTER X.

## CUTANEOUS SYSTEM.

**I. *Skin.*—Reproductive Power of the different Lamellæ of the Skin.—Diseases.—(I.) Unclassifiable Lesions. — Keloid. — Eiloid. — Lepoid. — Melanosis. — Encephaloid. — Scirrhous Tumors.— Hypertrophy.—Corns.—Warts.— Horny Excrescences. — Gangrene.— Sebaceous Tumors.—Hemorrhages.—(II.) Classifiable Lesions.—1. Exanthematous Diseases.—2. Pustular.—3. Papular.—4. Bullar.—5. Tubercular.—6. Scaly.—7. Syphilitic Diseases.—8. Stains. —II. *Nails.* — Reproductive Power. — Inordinate Length.—Absence.— Malformation.— Vicious Situation.—Onyxitis.—III. *Hairs.*—Similarity to the Nails.—Polish Plait.—Regenerating Power.—Hypertrophy.—Female Beards.—Softening.—Fragility.—Changes of Color. —Accidental Development of Hair.**

## SECTION I.

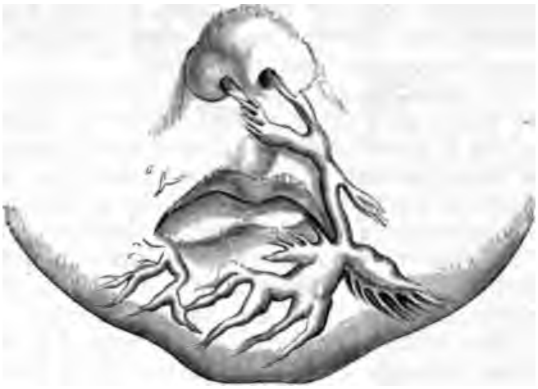
### SKIN.

### I. UNCLASSIFIABLE LESIONS.

1. *Keloid, Eiloid, and Lepoid.*—Keloid is most common on the neck, shoulder, and front of the chest, where it usually manifests itself by a small reddish point, about the size and shape of a grain of barley, which goes on increasing until it may attain the diameter of an inch

ore. The centre of the tumor is generally somewhat depressed, rface wrinkled, and its margin radiated, having some resemblance e claws of a crab, ce its name. (Fig. It is hard, re- g, and of a pale or deep cherry- olor. Its inte- exhibits a gray- fibrous appear- much like scir- of the female t, the rays shoot- out in different tions. Its pro- is slow, and it y ulcerates, but lways attended great itching. sionally it disap- , leaving merely a white, firm cicatrice. The most remarkable mstance about this tumor is its disposition to return after removal, this may happen repeatedly, until the patient is at length worn y his suffering.

Fig. 103.



Keloid growth of the face. From a patient at the College Clinique.

e late Dr. John C. Warren,[1] of Boston, was the first, I believe, to ibe a peculiar form of skin tumor, called *eiloid*, from its coil- disposition. In its early stages, it presents the appearance of a elevation, similar to that from a burn, which goes on gradually asing, without pain, heat, redness, or ulceration, until it acquires at size, and affects the patient's health. In a drawing accom- ing the account, the tumor has the appearance of a triple coil of ed intestine, the rolls lying in close contact, and being each four s long, arising by a narrow base from the right side of the neck. patient was a negress, fifteen years of age, whose health was other- disordered. Soon after its removal, the tumor reappeared at its er situation: it was again extirpated; and, showing itself a third it speedily proved fatal. Of the anatomy of eiloid nothing is n. The morbid growth probably takes its rise in the dermis, but at particular part has not been ascertained.

*poid*, so called for its bark-like appearance, is a rare affection. Its common situation is the cranio-facial region, generally the fore- , cheek, or temple. Its progress is slow, and old age is its favorite d of attack. Consisting in an inflammation of the dermis, it s its appearance in the form of a small, circumscribed speck, of ty color, which becomes covered with a very rough, brownish , resembling the bark of a tree. This falling off is soon replaced nother, of the same shape and color. Thus the disease is kept or many successive years. Ulceration ultimately sets in and the dermis exhibits a red, glossy surface, spicular, pitted, or granular, which throws out a thin, ill-looking pus. On examining the affected skin, it is found to be almost of a gristly hardness, its internal surface being studded with a number of small, whitish, rounded bodies, connected together by a dense, grayish texture. Very little pain attends this affection, and it often continues for many years before it manifests any malignant tendency.

---

[1] Surgical Observations on Tumors, p. 48. Boston, 1837.

2. *Heterologous Products.*—*Melanosis* of the skin may occur alone or in union with other morbid products. The most common form in which it shows itself is in that of small grains, of the size and color of a black currant. These little tumors are usually embedded in the dermoid tissue, and are sometimes quite numerous, giving the cutaneous surface a singularly tuberculated aspect: they seldom ulcerate, but when they do they always leave an unhealthy, intractable sore. Similar deposits almost always coexist in the subcutaneous cellular tissue, and in some of the internal organs.

*Encephaloid* has never been remarked as a primary disease of the skin, although it frequently extends to it from the subjacent textures, producing a red, spongy, tuberculated sore, more or less painful, and liable to bleed upon the slightest touch.

The *scirrhous tumor* of the skin exhibits, when cut, a grayish, dense, crisp texture, intersected by numerous fibrous filaments, and yielding a small quantity of lactescent fluid on pressure. In size, it varies between a pea and a pigeon's egg: it is rounded, conical, or pediculated, and occasionally rests upon a large flattened base. It often remains stationary for many years; but finally ulcerates, and reappears after extirpation.

3. *Hypertrophy.*—Hypertrophy of the skin is not uncommon. Occurring most frequently in old subjects, it is sometimes congenital, and involves either the whole thickness of the organ, or some of its component layers. The integuments of the nose are particularly liable to enlarge and thicken; the lesion is also sufficiently common on the neck, breast, arm, and back, forming rough, pendulous folds, several inches in length, which are usually somewhat darker than the skin in the normal state. Hypertrophy constitutes a prominent feature in elephantiasis, in burns, and in chronic ulcers of the inferior extremity. The enlargement, in some instances, implicates nearly the whole cutaneous surface, by which the movements of the body are impeded, and the individual acquires a hideous aspect.

The hypertrophy may be seated principally in the papillæ. The affection is sometimes congenital, sometimes accidental, and is met with in various degrees. When it accompanies or follows burns, blisters, and chronic eczema, the bodies in question often attain an extraordinary development; their volume is five or six times above the natural standard; they are of a pale brownish color; and they present an uneven, mammillated appearance, not unlike the pile of coarse plush, which is rendered particularly conspicuous when they are plunged into warm water. The dermis, in these cases, is often very much thickened, as well as indurated, and is covered with thin micaceous scales, which are easily rubbed off, and are constantly reproduced.

Hypertrophy of the epidermis is well displayed in certain affections of the skin, as corns, warts, and bunions, and, in a more striking degree, in ichthyosis and elephantiasis, in which the different cutaneous layers are sometimes of enormous thickness.

*Corns* are hard, dry, insensible callosities, occurring mostly on the lateral and dorsal surfaces of the toes, especially the first and last: they are also sometimes seen on the sole of the foot, between the fingers, and on the flexor tendons in the palm of the hand in working people. They owe their origin usually to inflammatory irritation of the cellular layer of the dermis, eventuating in the effusion of lymph, and the consequent thickening and induration of the cuticle. The texture of a corn, especially when old, is lamellated, and almost always more firm at the centre than at the circumference. By cutting away its superficial layers, a sort of internal nucleus is exposed, which has a whitish, horny-looking appearance, and often occupies a considerable portion of the substance of the dermis: it is generally more or less moist, and is now and then surrounded by a minute ecchymosis.

The form of these callosities, although variable, is usually rounded, and their size rarely exceeds that of a five cent piece. Some corns are movable, others fixed; and cases occur in which they have a sort of radiating root, extending deeply into the subjacent cellular texture. Their remote cause is pressure, commonly that of a shoe, which, if continued for any length of time, inflames the cutis, and renders it excessively painful. The complaint is more frequent in females than in the other sex, and in the rich than in the laboring poor.

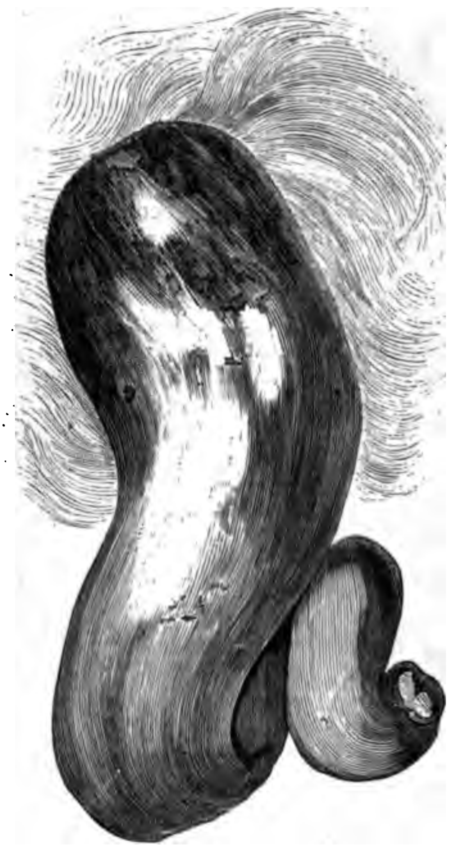
A *wart* is a hard, insensible excrescence, of a conical form; its surface is hard, tuberous, fissured, and almost indolent; in size, it seldom exceeds a common pea; in color, it is several shades darker than the surrounding skin; sometimes it is movable, sometimes fixed. Being of a radiated structure, it is composed of elongated, vascular papillæ, encased in the epidermis. It is caused by slow, chronic irritation, and often occurs in immense numbers on the hands and face of young persons. In the latter situation, warts are apt, in the more advanced periods of life, to take on carcinomatous action, either spontaneously, or from being frequently irritated. In the young, they often disappear spontaneously.

4. *Horn-like Excrescences.*—The skin is sometimes the seat of horn-like excrescences, occurring principally in those parts of the body where sebaceous follicles abound, as the face and scalp. In seventy-one cases collected by Dr. Villeneuve, twenty-six were seated on the scalp, five on the nose, two on the cheek, one on the lower jaw, four on the chest, four on the back, three on the anus and penis, four on the buttocks, twelve on the thigh, two on the knee, two on the ham, one on the leg, and three on the foot. They have also been seen on the scrotum, the back of the hand, and on the ear. Although the reverse has been asserted, they appear with nearly equal frequency in both sexes, during the period which intervenes between the ages of forty

and seventy. I have met with them in young children before the tenth year.

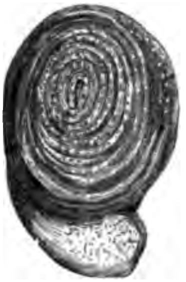
The size which some of these excrescences attain is surprising. (Fig. 104.) There is one in the British Museum, which is eleven inches in length by two and a half in circumference. From three to six inches is by no means an unusual size. Their direction is generally somewhat spiral, twisted, or bent; and, in their appearance, they often bear the closest resemblance to the horn of the sheep, being marked by rough, circular rings with intervening depressions, indicative of the successive steps of their development. In color, they vary from a dingy yellow to a dark grayish. They are of a firm, cartilaginous consistence, more or less flexible and conical in their shape, being large at their origin, and tapering toward their terminal extremity; when burned, they exhale a characteristic animal odor. Now and then their surface is imbricated, knobbed, or covered with small, pearl-colored scales. Internally they have occasionally a lamellated arrangement, as in Fig. 105. These excrescences are generally connected with the sebaceous follicles, and are often directly traceable to chronic inflammation, such, for example, as is produced by a burn, wound, or contusion. When first observed, they are quite soft, transparent, and invested by a distinct cyst, which, extending over their base, is gradually and insensibly lost upon their trunk. In a short time they become hard, assume a darker hue, and thus acquire the properties of the horny tissue. Their growth is always very slow, from three to five years elapsing before they attain any considerable size. When they drop off spontaneously, as they sometimes do, they invariably sprout out anew, pursuing the same course as their predecessors. The same

Fig. 104.



Horny excrescence growing from the scalp.

Fig. 105.



A section of the horn, showing its lamellated structure.

ing happens when they are extirpated without the precaution of
estroying the matral cyst. Several such excrescences are occasionally
bserved in the same individual.

5. *Gangrene.*—The production of gangrene of the external integu-
ents is by no means a rare occurrence. It is observed in different
tuations, and arises from a variety of causes, some of which seem to
ave a preference, so to speak, for this over other structures. Occa-
onally, therefore, it may occur as an original idiopathic affection; but
ore generally it is the result of specific inflammation, or of inflamma-
on depending upon external violence. Of the former, we have an
cample in malignant pustule, in phlegmonous erysipelas, and in com-
on carbuncle. As illustrating the present subject, I shall describe
alignant pustule, a disease which owes its origin to the operation of
me septic agent, and which is typical of this form of gangrene.

*Malignant pustule*, *charbon*, or *anthracion*, although very rare in this
untry, is often observed in certain parts of France, particularly in
orraine, Burgundy, Provence, and Languedoc. In the low marshy
istricts of these regions, the cattle are obliged to subsist upon bad
itiated provender; in consequence of which many of them are seized
ith dynamic fever, accompanied with gangrene of the skin. In the
mmer season, indeed, the disease sometimes prevails epidemically.
y dissecting animals that perish in this way, or by merely touching
eir hides or hair, the disease is readily propagated to the human
bject. There are numerous facts, also, which prove that malignant
ustule may be communicated by introducing the hand into the rectum,
agina, and throat of cattle affected with this malady; and similar
sults are produced by touching the blood, the secreted fluids, and
e excrements, or by injecting the former into the veins.

Shepherds, herdsmen, tanners, and butchers are most subject to the
isease; and the parts most liable to be affected are such as are
abitually uncovered, as the face, neck, and chest, together with the
ms and hands, the legs and feet.

The anatomical characters of the disease may be divided into three
ages, each of which is marked by some peculiarity, worthy of
parate consideration.

The time which elapses between the inoculation and the develop-
ent of the disease varies from three to eight days. It commences in
small circular prominence, the centre of which soon degenerates into
minute vesicle, about the size of a millet-seed, without heat, tension,
redness. As this vesicle enlarges, it assumes a brownish color, and
being ruptured, discharges a few drops of a yellowish bloody
rosity. At intervals, a good deal of itching is experienced, accom-
anied with a peculiar stinging sensation. This period lasts from
enty-four to forty-eight hours, and constitutes the first stage of the
sease.

The second stage, which rarely continues beyond a few days, is
aracterized by the development of a hard, movable, circumscribed
mor, of a yellowish livid color, with a rough granulated surface.
his is shortly surrounded by a purple, glossy-looking areola, on which
merous phlyctenæ, containing a reddish serosity, are situated, which

quickly run into each other. The disease, having penetrated the entire thickness of the dermis, now invades the subjacent cellular tissue, and the centre of the little tumor presents all the features of an eschar.

In the third stage, the gangrenous point rapidly extends, and the enlarging areola rises above the eschar, causing its centre to be depressed. The surrounding surface is tense, emphysematous, and of an erysipelatous red; the acrid heat and stinging are succeeded by a sense of weight and numbness; the disease burrows deeply into the cellular texture; and the mortified skin is of a blackish color, and a firm, leather-like consistence. From twenty-four to seventy-two hours is the usual duration of this stage, which is commonly attended with high constitutional excitement. The size of the slough, at this period, varies from six lines to several inches.

But it is not always that malignant pustule observes this regularity. The different stages often succeed each other in rapid and indistinct succession; the disease having proved fatal in less than twenty-four hours after its commencement. When it terminates favorably, a red inflammatory circle appears, which serves as a line of demarcation between the dead and living parts.

From experiments performed in 1816, by M. Berthèlemy,[1] a professor in the Veterinary School at Alfort, near Paris, it appears that the ichorous matter furnished by malignant pustule retains for a long time its nocuous properties. Having put some of the fluid in a corked vial, he preserved it for about eleven months, when he inserted a portion of it into the skin of a stout, healthy horse. The consequence was a gangrenous tumor, having all the characteristics of malignant pustule, and which, notwithstanding the small quantity of virus, killed the animal in three days.

In *ordinary gangrene*, or in that variety which arises from excessive inflammatory action, the color of the skin changes from a florid red to a darker shade, acquiring, during the progress of the disease, a purple, livid, or blackish hue. Concurrently with this change of color, the affected part undergoes a decided alteration of structure. It feels soft, boggy, and emphysematous, and the cuticle is raised into numerous phlyctenæ, filled with bloody looking serosity. When completely deprived of vitality, the skin sometimes becomes a shade or two lighter, and is detached in soft, grayish, inelastic strips, which are often bathed with a thin, ichorous, and offensive fluid. "The ash colored slough seems to occur most frequently in skin which is moister, and the black-colored, in skin which is more dry, than common."

There is a species of cutaneous gangrene, to which, from the peculiarity of its appearance, we may apply the term *white*. It generally comes on without appreciable cause or preliminary symptoms, in irregular shaped patches, from one to three inches in diameter. The sloughs are of a dead milky color, and of a hard, dryish consistence, yielding little or no moisture on pressure. Any portion of the body may be the seat of this affection; but the arms, back, and chest are the parts

---

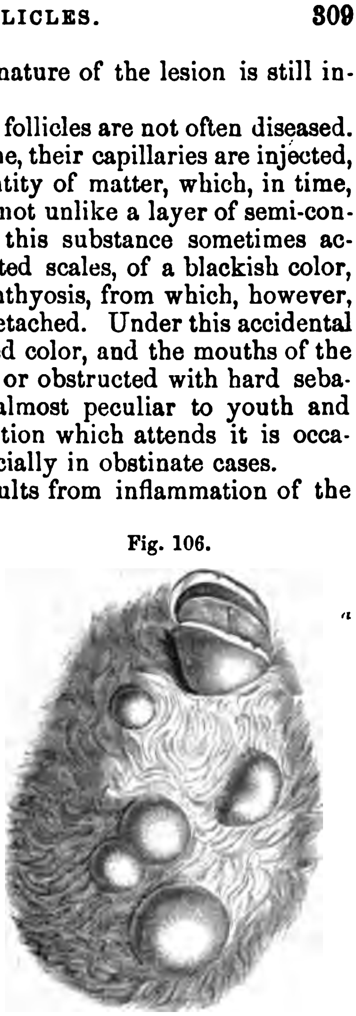
[1] Dictionnaire de Médecine et de Chirurgie Veterinaire, t. iii. p. 713.

st frequently implicated. The true nature of the lesion is still in-
ved in mystery.

). *Sebaceous Follicles.*—The sebaceous follicles are not often diseased.
hen inflamed, they augment in volume, their capillaries are injected,
l they pour out a preternatural quantity of matter, which, in time,
ms an unctuous, tenacious covering, not unlike a layer of semi-con-
te wax. If it be allowed to remain, this substance sometimes ac-
ires the appearance of thick, imbricated scales, of a blackish color,
ich may be mistaken for those of ichthyosis, from which, however,
y differ, in being much more easily detached. Under this accidental
ering, the skin is of an unusually red color, and the mouths of the
icles are either very much enlarged, or obstructed with hard seba-
us matter. This disease, which is almost peculiar to youth and
ilts, may last for years, and the secretion which attends it is occa-
nally of a sero-purulent nature, especially in obstinate cases.

Another effect which sometimes results from inflammation of the
aceous follicles, is the formation
*ncysted tumors*, containing meliceric,
eromatous, or steatomatous matter,
several of these substances con-
ned. The mouth of the follicles
ng obstructed, and the natural
retion going on, their cavity gradu-
y expands, until the sac acquires,
some instances, the volume of
apple, or even of a fist. The
ietes of these tumors are occa-
nally quite hard and thick, like
dura mater; and cases are ob-
ved, though very rarely, in which
y are ossified, or transformed into
o-cartilage. Externally, they are
gh, being connected to the sur-
nding parts by cellular tissue; in-
nally, on the contrary, they are
nerally smooth and glistening.
all sacs are sometimes observed
the interior of these tumors.

Fig. 106.

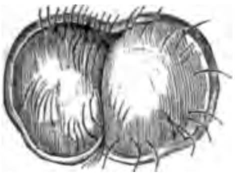


Sebaceous tumors of the scalp: *a*. A tumor laid open to show its cyst and contents. From a preparation in my collection.

In their shape, these tumors are for the most part globular, and
y are found by far more frequently on the face and scalp than
any other situation. Their number, although usually small, may
very great. Thus, in the case of a man, aged forty, I counted
veral hundred on the head and trunk alone. Most of them com-
nced when he was quite young, soon after bathing in cold water.
e tumors were of the meliceric kind, and the largest were about
volume of a hen's egg; the surface of many was uneven, and
rtially incrusted with hard, sebaceous matter of a dark color. Oc-
sionally they occur in several members of the same family; and
w and then they display an evident hereditary tendency, as in a
e which fell under my observation in 1840. In this instance, the

disease existed upon the scalp of a young woman of twenty-seven, and upon that of her father, a paternal aunt, and her paternal grandmother. The tumors were, respectively, from four to seven in number, and varied in volume from a marble to a walnut. Tumors of this kind are usually somewhat movable, although, in this particular, much depends upon their age and location. They are unattended with pain, have no malignant disposition, and the skin covering them generally retains its natural character. Sometimes the contents of these tumors are thin, watery, and exceedingly offensive. In other cases, short hairs, very soft, and provided with well-formed roots, are found in them. (Fig. 107.)

Fig. 107.



Cyst of a sebaceous tumor, with hairs in its interior.

The sebaceous follicles, instead of secreting their accustomed humor, occasionally deposit a hard, *calculous* substance. Meckel[1] relates the case of a young lad, the skin of whose buttocks was completely studded with small concretions of this kind; and similar bodies have been repeatedly found in the sebaceous follicles of the forehead and root of the nose. Their chemical composition has not been determined, but it is probable that they consist mainly of phosphate and carbonate of lime, agglutinated by a minute quantity of animal matter.

7. *Hemorrhage.*—The skin is sometimes the seat of hemorrhage. The only form which I shall describe is what is called purpura. Of this, three varieties may be recognized, the petechial, simple, and complicated, or, as it may be denominated, the hemorrhagic. These varieties are referable principally to the extent, form, and situation of the effused blood; and may all occur simultaneously or successively in the same individual. No period of life is exempt from this disease.

In the *petechial* species, the blood is collected in minute isolated points, situated immediately beneath the cuticle; they are of a circular shape, from the fourth of a line to a line in diameter, seldom or never elevated above the surrounding surface, and usually of a pale color, though frequently of a deep red or purple. The lesion, generally concomitant of plague, typhoid fever, scurvy, and dysentery, is almost always most conspicuous on the chest, back, and inside of the extremities.

In *simple* purpura, the parts principally affected are the arms and legs, especially the latter. The effusions take place slowly and successively, so that, while some are fading and disappearing, others are forming and increasing. They are at first of a vivid red color; but, in a few days, they acquire a deeper and more livid hue; and, in proportion as the blood is removed by absorption, they become greenish, then yellowish, and ultimately vanish altogether. They are also of a circular shape, but much larger than in the petechial variety, being from one to eight lines in diameter, and seated between the cuticle and mucous network, or in the dermis and cellualr tissue, or in both these situations simultaneously. The duration of the individual blotches is from six to ten days; of the disease, from one to twelve months.

---

[1] Voigtet's Handbuch der Path. Anatomie, Halle, 1804. Erster Band, p. 85.

The essential difference between the preceding and the *complicated* variety of purpura, consist in the effusions, in the former, being confined to the external surface; whilst, in the latter, they not only occur in this situation, but also in other parts of the body, especially beneath the mucous and serous membranes of some of the principal organs. The blotches are likewise of a deeper color, larger, and less regular in their shape, in many cases bearing a striking resemblance to the ecchymoses which follow a bruise or contusion. Indeed, the slightest pressure is frequently sufficient to produce them, particularly in parts where the skin is very thin and the cellular tissue abundant. When the effusion is considerable, the cuticle is sometimes elevated into small bladders, which, on breaking, give vent to black, semifluid blood. This occurrence, however, is extremely rare, and, in general, there is not the slightest elevation. This variety of purpura usually begins on the legs and thighs, whence it gradually extends over the trunk and arms. The hands and face almost always escape.

Are these effusions the result of a rupture of the vessels, or are they caused simply by exhalation? Of the two, the latter supposition is, perhaps, the more correct; at all events, we rarely find any communication whatever between them and the neighboring vascular branches. The subject, however, requires further investigation; for our knowledge of the morbid anatomy of this affection is, to say the least, extremely imperfect, and does not enable us to offer any satisfactory explanation, either of the nature of its predisposing causes, the character of the primary local lesion, or of its complications.

Besides the varieties now described, there is another form of hemorrhage, in which the blood oozes from certain regions of the cutaneous surface, in the same manner as it sometimes does from the mucous membranes. The discharge is most frequent in hysterical girls, about the age of puberty, and is usually *vicarious* of some similar natural or morbid state in a remote organ, which is almost always the uterus. The skin appears as if covered with a sort of dew, the blood being effused in minute globules, which, on being wiped away, are presently followed by others. The exhalation, especially in females, is commonly periodical, and shows itself simultaneously or successively at a number of points, as the face, chest, umbilicus, hand, and foot.

## II. CLASSIFIABLE LESIONS.

1. *Exanthematous Diseases.*—The exanthematous diseases are characterized by the occurrence of more or less inflammatory redness in the superficial portion of the dermis, which momentarily disappears under the pressure of the finger, runs its course in from two to six days, and is always preceded and accompanied by constitutional symptoms. The efflorescence is sometimes circumscribed, sometimes diffuse, and occasionally, as in scarlatina, covers the whole body. The usual termination of these affections is by resolution and desqua-

mation. Several of them are of a contagious nature, and occur only once in the same person. The diseases included in this group are roseola, urticaria, erythema, rubeola, scarlatina, and erysipelas.

*Roseola* is characterized by rounded, circumscribed spots, closely set together, of a deep red color, and from four to six lines in diameter These patches, which disappear in the course of twenty-four hours, ar almost always dependent upon gastro-intestinal derangement, and ar rarely followed by any appreciable desquamation. The disease is no contagious; it is commonly marked by febrile disturbance, and ofte covers only a part of the body, as the neck, trunk, or extremities. I may occur at any period of life, as well as in both sexes, but is mo frequent in women and children. Roseola seems to be seated in th most superficial portion of the dermis, and to consist in a transie injection of the cutaneous capillaries. There is a variety of this di ease, in which the spots are arranged in the form of rings, the centr of which retain their normal color: two or three such rings, of variab breadth, are sometimes situated the one within the other.

*Urticaria*, familiarly called "nettle-rash," is a non-contagious infla mation, the duration of which varies from a few days to sever months. It appears in the form of prominent wheals, of an irregul shape, paler or redder than the surrounding skin, usually of short co tinuance, and always attended by a peculiar stinging sensation. I severe cases, the wheals are often very large, hard, and deep-seate involving the subjacent cellular tissue with a tense, sore, and tum state of the skin. The favorite situations of the eruption are th shoulders, loins, forearms, thighs, and knees. The disease frequentl changes its position, appearing at one time here, and at another ther as to the individual patches, their duration seldom exceeds twent four hours. The anatomical characters of urticaria are imperfect understood.

*Erythema* is an uninfectious exantheme, the distinguishing traits which are superficial blotches, of a deep florid color, lasting from few days to a fortnight, irregular in their shape, and varying in dia eter from several lines to many inches; the redness momentarily di appears under the pressure of the finger, and is seldom attended wi any appreciable swelling. The disease is most common in femal and young, weakly persons; and the neck and chest, together with th superior extremities, are its most frequent situations. Erythema o casionally occurs in regularly circumscribed spots, of a circular shap and about the size of a split pea; they are slightly prominent, of bright florid color at the commencement, and subsequently of a viol hue, especially at their centre. This constitutes the *papular* varie of Willan. Another form is the *nodose*, in which the patches, also co siderably elevated, are of an oval shape, and from a few lines to inch in diameter. In other cases, the redness is annulated, marginat or diffused over a large extent of surface. In whatever form it ma appear the blotches seldom suppurate, nor are they always followe by desquamation of the cuticle.

*Rubeola* is an epidemic malady, occurring for the most part in youn children, during the winter and vernal months. It rarely attac the same person more than once. The eruption appears about the fourth day from the commencement of the indisposition, and is first seen on the forehead, face, and neck, from which it gradually spreads over the rest of the body. It consists of small red pimples, which are slightly elevated above the surrounding level, and look very much like so many flea-bites. In the progress of the disease, the little specks become more prominent; their color is heightened, and their diameter expands, until at length, coalescing with each other, large patches are formed, of an irregular semilunar shape, with small intervals of sound skin. A minute vesicle occasionally appears at the centre of each spot, filled with a whitish, watery fluid. The swelling of the skin is commonly very trifling, and the redness, which attains its acme in about twenty-four hours after its first appearance, has commonly a shade of purple. The eruption lasts from three to four days, declining pretty much in the order in which it began, and is constantly followed by a branny scurf-like exfoliation of the epidermis.

*Scarlatina* comes on from three to six days after exposure. Attacking children in preference to adults, it often prevails epidemically, especially in winter and spring, and in one form at least is a source of immense mortality. This form is the malignant, so termed from its being attended with great depression of the powers of life, and from being complicated with violent inflammation of the palate, tonsils, and pharynx. The efflorescence breaks out from twenty-four to forty-eight hours from the moment of the invasion of the disease, first on the face and neck, then on the trunk, and finally on the extremities. It consists of myriads of small red points, so closely grouped together that the whole surface exhibits a red scarlet hue, and feels rough to the touch, as if fine sand were strewed over it. The color is generally most intense in the evening, and has been compared, not unaptly, to that of a boiled lobster; it reaches its height about the end of the third day, begins to fade on the fifth, and disappears entirely about the seventh. With this efflorescence there is usually violent heat of the skin, with a sense of fulness, and more or less itching; and, in many cases, the mouth and tongue, together with the throat, are of a deep fiery color, evidently from an extension of the disease. Small vesicles sometimes appear on the eruption, resembling those that are occasionally noticed in rubeola, and containing a thin sero-plastic fluid; they seldom continue longer than four days, and it is not improbable that they are produced by some disorder of the sebaceous follicles. Their number is sometimes immense. In the case of a young girl twelve years of age, who came under my observation three years ago, the whole body was literally covered with them; they were about the size of a common pin-head, of a whitish color, and filled with a thin, tenacious fluid, which seemed to be gradually absorbed, as none of the little vesicles burst and discharged their contents. The desquamation, which is generally lamellar, begins about the seventh day, and is accompanied by disagreeable itching.

The last disease to be described, under the present group, is *erysipelas*. In the United States, as well as elsewhere, this is an extremely common affection; it may be idiopathic or traumatic, epidemic or sporadic; and is supposed, not without reason, to be sometimes contagious. It spares no period of life; for it occurs in new-born infants, in middle age, and in decrepitude. It is most common in persons of a deteriorated, worn-out constitution, and is usually preceded, as well as accompanied, by symptomatic fever. Although erysipelas may appear on any part of the body, the head, face, and legs are out of all proportion its most frequent situations. Of this disease, there are two important varieties, the simple and the phlegmonous.

The first, which has its seat exclusively in the dermoid tissue, is characterized by diffused redness, with slight swelling, increased heat, and a tingling, burning sensation. The discoloration is of a deep cherry hue, and disappears momentarily under pressure. When the inflammation runs very high, the cuticle is elevated into vesicles, varying in size from a pin-head to a hazel-nut, isolated or conglomerated, and containing a thin, straw-colored, or bloody serosity. The vesications usually appear within the first forty-eight hours, break in a day or two after, and are replaced by thin, hard, yellowish crusts, which subsequently blacken. In milder cases, the disease subsides much sooner: the redness, about the third or fourth day, assumes a dusky yellowish tinge, the swelling diminishes, the skin becomes wrinkled, and the epidermis is detached in small bran-like scales. Few or no vesicles are observed. This variety is sometimes erratic, that is, it suddenly disappears at one point, and attacks another, leaving no other traces than a slight desquamation.

In the *phlegmonous* variety, besides the phenomena above described, there is often great swelling of the subcutaneous cellular texture, with infiltration of acrid and bloody serosity, suppuration, or sloughing. This form of the disease is most frequent about the eyelids and the legs, in old, intemperate subjects. Great constitutional disturbance usually attends: the affected part is exceedingly painful, and the dermoid and cellular tissues often slough in large patches, the latter coming away in dark-colored, dirty-looking shreds.

2. *Pustular Diseases.*—Pustules are produced by inflammation of the dermoid textures, terminating in an effusion of matter, which elevates the cuticle into small circumscribed tumors. The genera comprehended in this order are acne, sycosis, ecthyma, porrigo, impetigo, vaccinia, variola and varicella. Some of these affections are acute, and others chronic; some are contagious, and others not; some are discrete, and others confluent. Differing as they do in these particulars, they all resemble each other in the fact of their terminating in a scabby incrustation, varying in thickness and density in different cases, and leaving, on dropping off, the surface to which it adhered, for some time, of a red color.

*Acne* is a chronic inflammation of the sebaceous follicles, lasting from several weeks to as many years, characterized by the presence of small, isolated pustules, the most common seat of which is the upper and back part of the trunk, though they are often seen also on the forehead, nose, chin, and temples. The limbs are seldom affected with them. The disease is equally frequent in both sexes, and is particularly apt to occur about the age of puberty. The follicles are enlarged, their parietes are engorged with blood, and their orifices are marked by black points, giving the disorder its characteristic aspect. Each pustule is encompassed by a red areola; matter, mingled with the natural secretion, gradually forms in its interior; and, after a short time, a thin scab appears, which, on falling off, exposes a florid and slightly elevated prominence, that gradually sinks to the level of the surrounding surface. Small scars sometimes remain; and, in old chronic cases, the skin is often quite hard, exhibiting a rough, granulated appearance, with varicose enlargement of its vessels.

Seated in the sebaceous follicles, and closely allied to the disease just described, is *sycosis*, the mentagra of Willan and Alibert. Its distinguishing feature is the successive evolution of numerous sharp-pointed pustules, scattered over the hairy scalp, upper lip, chin, lower jaw,-and side of the face, occurring usually in adults, and preceded by considerable redness of the affected part, with a sense of heat and tension. Red vesicles soon become visible, which, by the third day, assume a pustular form, standing out like circumscribed elevations, the summits of which grow white, and gradually fill with pale yellowish matter. The prominences subsequently increase a little in size, and, when fully developed, are as large as a millet-seed. Between the sixth and seventh day, each pustule bursts, its sides shrink, and a slight discharge takes place, which dries into a brownish crust, that is feebly adherent to the skin, and insensibly lost in the adjacent epidermis.[1]

When the pustules are very numerous, they sometimes coalesce, and the inflammation is then apt to extend to the subjacent cellular texture, which is rendered hard and painful, and exhibits all the appearances of a true phlegmonous swelling. The pustules themselves are quite large: they rest upon a red, tuberculated base, often contain bloody matter, and are covered with thick, dirty-looking incrustations. The skin is sometimes very much altered, sprouting out in the form of moist, vegetating excrescences. Arrived at this stage, the disease is extremely intractable, and presents a most loathsome aspect; the hair falls out, and the part is constantly bathed with a thin, sero-sanguinolent fluid, often excessively acrid in its character.

*Ecthyma* is an inflammatory affection of the dermoid texture, non-contagious, and characterized, at its height, by large, rounded pustules, usually distinct from each other, and resting upon a hard, florid base. All parts of the body are liable to it; but the regions most frequently involved are the neck, chest, and shoulders. The eruption generally begins by small, reddish elevations, which rapidly augment in size, and become filled, in the course of a few days, with sero-purulent matter, the base, in the mean time, extending in diameter, and exhibiting a bright scarlet hue. In this state, the larger and more mature pustules have a conoidal shape, are hard and painful on pressure, and bear a close resemblance to small boils, their size being between that of a lentil and a pea. A pseudo-membranous substance is also frequently to be distinguished in their interior, particularly towards their centre.

---

[1] Rayer's Treatise on Diseases of the Skin, p. 481. Second edition. London, 1835.

In from three to five days, the contents of the pustules escape, a
concrete into thick, whitish adherent scabs, the disengagement of whic
occurring at indefinite intervals, leaves the part of a red, livid colo
each spot being from four to eight lines in diameter, and marked at i
centre by a minute, superficial cicatrice. Acute ecthyma is often
companied by severe lancinating pains, and has only one crop of p
tules; whereas the chronic form of the disease, which is by far t
most common, has always a continued succession of them. Some
the pustules occasionally terminate in ulceration, producing ill-c
ditioned, painful sores, attended with a sanious bloody discharge,
followed by thick, dark-colored crusts.

*Impetigo* is a non-contagious chronic disease, which is exceedin
prevalent in this country, in young children during the period of d
tition, especially in such as are of a scrofulous habit. It is most
quently observed on the face and legs, and next in order on
forehead, neck, and trunk. In some instances—and these are
infrequent—the disease covers all these parts simultaneously, or g
dually travels from one to the other. The pustules are small, irre
larly circumscribed, with only a slight elevation of the cuticle,
terminate in thick, rough scabs. The disease is accompanied
produced by inflammation of the part affected, which continues for
indefinite period, and causes considerable enlargement of the capill
vessels, particularly of the veins. At first, the eruption is vesicul
but, like that of smallpox and other kindred disorders, it becon
pustular, the elevations being distended, in a few days, with sero-pu
lent matter, which is often poured out in great abundance, and rapi
hardens into thick, semi-transparent, friable scabs, resembling fr
ments of dried honey. Occasionally, the incrustations, instead of bei
of a clear yellowish color, are of a light greenish, brown, or mahog
hue. The scabs having fallen off, the denuded skin is observed to
of a deep red complexion, slightly fissured, abnormally thick, ten
on pressure, and to exude a considerable quantity of sero-purul
matter.

Impetigo appears under two principal varieties of form—the sm
pustules that characterize it being, in the one, irregularly dissemina
with healthy or more or less inflamed intervals—in the other, dispo
in groups, generally of an oval shape, and resting on a tumid, ro
colored base. Each of these varieties is acute or chronic, accordi
as there is only a single crop of pustules, or a successive reproducti
Closely as this disease resembles ecthyma in many of its features,
can always be easily distinguished from it by the smaller size of
pustules, their mode of development, and the lighter color of th
base.

The term *porrigo* is applied to a chronic inflammation of the ski
essentially contagious in its nature, and characterized principally
the appearance of its scabs, which are of a bright yellow color, ve
dry, thoroughly adherent, and of a circular shape, with a centr
cup-like depression, and thick, prominent, and inverted edges. T
most usual seat of the disease is the scalp, from which, however,
often extends to the forehead, temples, chin, eyelids, and other regio

until, in some instances, it covers almost the entire body. Occurring in both sexes, at all seasons of the year, and at all periods of life, it is most common in infancy and childhood, and is always of indefinite duration, lasting at one time only a few weeks, at another a number of months, and, in a third series of cases, perhaps several years. Alibert describes five varieties of porrigo; Willan not less than six. These divisions are certainly uncalled for, as they differ from each other merely in the intensity of the morbid action, the location of the disease, and the distribution of the pustules. The mildest form of the eruption affects the head and face of infants, and is usually known by the name of *crusta lactea.*

Porrigo, in whatever form it may appear, or wherever situated, always commences in very small pustules, scarcely rising above the surrounding surface, and covered, from the very first, with a thin, yellowish crust, with a minute, central pit. Examined at this period, the pustules are found to contain a drop of sero-purulent matter, which, instead of escaping, as happens in most other kindred diseases, always remains, and dries in their interior. The scab, manifesting itself, as we have just seen, almost simultaneously with the eruption, goes on increasing until it reaches the diameter of a ten cent piece; its central depression in the mean time becomes remarkably distinct; and, in the course of a week or so, it acquires all the characters above assigned to it. When the pustules are confluent, the incrustations often cohere, and are detached in large yellowish masses, leaving the cuticle tender, red, elevated, and marked with deep lines. Excessive itching generally attends this disease, and the scabs are often reproduced in great numbers and with astonishing rapidity.

The odor of the scabs is peculiar. In general it resembles that of the urine of the cat. When the scabs are softened with emollient poultices, the smell changes, becoming faint, sickening, and a good deal like that caused by boiling bones with their ligaments. The substance of which they are composed has been analyzed by Thenard, who found that one hundred parts contain seventy of coagulated albumen, seventeen of gelatine, five of phosphate of lime, and eight of water.

Porrigo is supposed by some to be seated in the piliferous follicles, an opinion which seems so much the more plausible, when it is remembered that the disease principally occurs in those regions which abound in these structures, and that a hair frequently occupies the centre of each pustule. However this may be, the hairs are always considerably affected; they become dry, stunted in their growth, and many of them fall off. This is particularly apt to take place in chronic porrigo of the scalp, the *furfuraceous variety* of Bateman, which is almost always attended with permanent baldness. Occasionally, the piliferous follicles remaining, a new crop of hairs is produced, which are then thin, white, and downy.

*Vaccinia*, vulgarly called cow-pox, is a contagious disease, which is transmitted by inoculation from one individual to another, and which is characterized by the development of large, multilocular, pearl-colored pustules, surrounded by an erythematous areola, and succeeded by a brownish scab, which falls off about the twenty-fifth day, leaving pitted scar. Three well-marked stages are to be observed in the pr gress of this affection.

The first stage commences on the fourth day after the insertion the virus, and terminates on the ninth. At this time the true vacci inflammation first manifests itself, and the puncture, which until n resembled a mere scratch, assumes a pale rose color; it is somew conical in its shape, rises a little above the surrounding surface, a presents the appearance of a flea-bite. By the fifth day, the po has augmented considerably in volume; it is of an umbilical fo with a slight central depression, and its cuticular covering is eleva by a minute quantity of transparent fluid into a firm and resisti pustule. On the sixth day, all these characters are more distinct, the affected part stands out in bold relief. The vaccine tumor is creased in all its dimensions, and its inflamed surface has a m transparent and polished aspect. The pustule, which until now quite small, occupies a circle of about a line in diameter; its surf has a radiated, argentine appearance; its edges are smooth rounded; and its centre is not only more depressed, but it is ha dry, and of a darkish color. From this time on, the pustule gradua augments in size, the margin becomes more prominent, and the cen exhibits a concave cup-like form.

During the second stage, that is, from the ninth to the eleve day, the pustule attains its most perfect development, being ab four lines in diameter, and projecting from one to two lines ab the surrounding level. It is encircled by a vivid red areola, of several inches in extent, its margin becomes more full, and central depression is either partially or wholly effaced. The eryt matous surface around is the seat of a great number of minute vesic and there is marked swelling of the subjacent cellular tissue, exte ing generally to the axillary ganglions, and rendering the limb and painful. The virus, which is now ripe for use, is still limpi and, if the pustule be punctured, it will ooze out, drop by drop, u the little cells containing it are emptied. These cells, as has be ascertained by dissection, are extremely small, as well as numero and perfectly distinct from each other, none of them communicati together. They are arranged in two concentric rows; and the cen of each pustule is occupied by a minute quantity of yellow, mud pus, contained in a sort of funnel-shaped receptacle just beneath cup-like depression of the epidermis.

On the eleventh day, the commencement of the third stage, desiccating process sets in. The central depression assumes the pearance of a light brownish crust, the contained virus acquires muddy serous color and a viscid, ropy consistence, the areola gradual fades, the swelling decreases, and the epidermis falls off in small f furaceous scales. By the fourteenth day, the pustule is great diminished in size, the scab is of a horny hardness and of a yellowi complexion, and the areola is reduced to a narrow purple circle n more than the eighth of an inch in diameter. From this period, t swelling and tension of the arm rapidly subside, while the vaccine cru augments in density and depth of color, and is detached about the twenty-fifth day, counting from the insertion of the virus. The scar thus disclosed, is slightly depressed, of a circular shape, from three to five lines in diameter, and of a pale, reddish hue, exhibiting a number of small honey-combed pits, indicative of the number of cells of the vaccine pustule. The cicatrice becomes ultimately whiter than the surrounding skin, and the pits remain indelible.

The fallen scab is of a brownish mahogany color, hard, dry, brittle, of a circular shape, and more solid, as well as thicker and more opaque, in the centre than at the circumference. Its upper surface is smooth, convex, and somewhat polished; the other, on the contrary, is rough, flattened, or slightly concave. Albumen is its chief ingredient. When recent, it may be cut into thin, grayish slices, which expand by maceration, turn white, and exhale a sickening animal odor. Drying hardens it very much, and trituration with water converts it into a ropy, cream-like mixture, which is capable of communicating the disease. The induration of the scab is much influenced by the atmosphere. If the air is excluded, the secreted matter is thrown off in small, soft pieces, without the formation, frequently, even of a scar.

*Variola* is an acute cutaneous inflammation, consisting of numerous umbilical pustules, preceded and accompanied by fever. It is contagious, occurring generally only once in the same person, and running its course in about twenty-eight days. When the pustules are situated some distance from each other, the disease is said to be distinct, and confluent when they are agglomerated. It is also divided into natural and inoculated, according as it arises spontaneously, or from the introduction of the smallpox virus. The period which intervenes between the infection and the development of the disease varies from six to twenty days. The pustules not only cover the skin, but frequently also the mucous surfaces that are directly continuous with it, as the eyes, mouth, and pudendal lips.

The eruption, which is sometimes preceded by a general erythematous blush, usually takes place from forty-eight to eighty hours after the commencement of the indisposition, appearing first on the face and neck, then on the chest, abdomen, arms and legs, and lastly on the hands and feet. This order of invasion, however, is not constant; for it not unfrequently happens that the disease first manifests itself on the trunk, and even on the extremities, before it attacks the head, although it is on the latter region that it is always most violent. The eruption begins in small, red, circular points, having very much the aspect of flea-bites, and which, although widely dispersed originally, rapidly multiply, and, in a few days, complete their number, the cutaneous surface being, in the mean time, hot, tumid, and shining. During the period which intervenes between the efflorescence and the suppuration, embracing nearly one week, the elevations gradually increase, project above the level of the surrounding parts, and assume the appearance of distinct pustules, each of which exhibits a well-marked central depression. As early as the second day, these elevations are already bounded by a regularly formed ring of inflammation: their form is umbilical, and their summit contains a drop of limpid fluid. In this manner, the development proceeds until suppuration commences, which it usually does about the sixth day. Durin this period, constituting what is termed the eruptive stage, the pustule have a cellular structure, being composed of little compartments, separated by thin partitions which converge to a central point.

The suppurative process having commenced, the pustules lose thei umbilical shape and become hemispherical; their surface acquires rough, whitish aspect; and their contents continue to grow more an more opaque, being at first of a milky hue, and afterwards of a pal straw color, with various degrees of turbidity. A small circular spec now generally appears in the centre of each elevation, which graduall extends towards the circumference, until at length the whole supe ficies assumes the same purulent look. Whilst these changes ar taking place externally, the internal cellular structure gives way, th little compartments are broken up, and the matter occupies a singl cyst, with dense, resisting parietes. With proper care, this cyst ca be readily lifted out of its situation: it is of a rounded shape, from two to four lines in diameter, and is deeply lodged in the dermis, projecting a considerable distance into its substance. The suppurativ process usually begins on the forehead and face, and ends on the hand and feet, where the pustules also remain much longer before the break, owing, no doubt, to the great thickness of the cuticle. Th intervals between the pustules, during this stage, are generally tumid from the infiltration of sero-albuminous matter, and of a florid red, th inflammation being of a phlegmonous character; and the patient experiences a sensation of tension and soreness, occasionally amountin to real pain.

About the tenth day, the pustules have arrived at their full height they are filled with thick, yellowish pus, and present the appearanc of so many little abscesses. The desiccating process always begins o the face, whence it gradually extends to the other regions of the body occurring last on the feet and hands. It is usually accompanied wit violent itching, and with a peculiar nauseous odor, not unlike tha exhaled by the rattlesnake. The scabs, falling off from the tenth t the fifteenth day after the appearance of the eruption, are of a brownish color, lamellated, dry, and of a horny consistence. The scars whic are left by their detachment, and which are commonly confined to th cranio-facial region, are depressed at their middle, and traversed b small narrow ridges, which often greatly disfigure the features, esp cially in the confluent variety. In regard to their form the utmos irregularity prevails, some being circular, some oval, others angula Their depth is usually considerable, presenting an appearance as if the occupied a goodly portion of the thickness of the dermis. These sca are at first red, but soon change to a dark purple color, which the retain for many weeks; by degrees, however, they grow whiter an whiter, but they always remain more pale and opaque than the rest the skin.

The skin of variolous subjects putrefies much more promptly tha the cutaneous tissue in the sound state. By artificial injection, all th capillaries can be so completely distended as to give the affected par a red scarlet hue; but it is a singular fact that none of the matter ever finds its way into the pustules, or even into the dermoid substance immediately around them, owing to the circumstance that all the vessels in this situation are either obliterated or wholly destroyed, the tissue itself being of a deep, uniform color, and infiltrated with blackish blood. If mercury be used, a portion of it is generally effused both around and within the pustules; yet none of it appears to enter their vessels.

Allied to the disease just described is *varicella*, which, like smallpox, is contagious, and usually occurs only once in the same individual, attacking children in preference to adults. Preceded by slight fever and other symptoms of derangement, the eruption generally commences on the body, though sometimes on the face and limbs, and gradually rises into small, red, circular points, which, in turn, are replaced by lenticular, globular, or conical pustules, somewhat analogous to those of variola. The pustules are sometimes discrete, sometimes collected together; they are surrounded by a red, rose-colored areola, contain a transparent serous fluid, which in time assumes a thick milky appearance, are soft and flaccid to the touch, and generally terminate, from the fifth to the ninth day, with a thin, brownish, furfuraceous desquamation, which rarely leaves any cicatrice. The eruptive stage of varicella is rarely completed under two or three days, and hence the disease is often prolonged to a fortnight, the parts on which it first broke out being covered with scabs, when the pustules in other regions have scarcely arrived at maturity.

3. *Papular Diseases.*—The lesions arranged in this order are characterized by hard, solid elevations, usually of the color of the skin, to which they impart a rough, uneven sensation, preceded and accompanied by pruritus, and terminating by resolution, desquamation, or slight ulceration. Their progress is commonly slow; and there is no part of the cutaneous surface which is not liable to be attacked by them. The only diseases belonging to this division are lichen and prurigo.

*Lichen* is a non-contagious disease, which may appear on any part of the body, though in most cases it manifests a decided preference for the neck, face, hands, and forearms. It is distinguished by hard, firm papulæ, generally of a white color, sometimes red, almost always clustered together, and accompanied with considerable itching, which is augmented by the heat of the bed, and liable to well-marked exacerbations. The elevations are seldom larger than millet-seeds; and, although commonly aggregated into irregular groups, yet occasionally they are united into circular patches, or into long, narrow strips, stretched spirally around the affected part. The accompanying redness, if there be any, disappears about the end of the fourth day, though sometimes not until much later, and is followed by a slight furfuraceous desquamation, which may continue for several weeks, or even months. In violent cases the papillæ occasionally ulcerate, and discharge a thin, sero purulent fluid, which gradually concretes into small, soft, yellow scabs, somewhat rough, and easily removable. At other times, again, the elevations become confluent, and are surrounded each by a small, reddish border.

In chronic lichen, the skin is harsh, dry, and sometimes considerably thickened. Deep fissures are also frequently observed, especially about the joints, and the cutaneous functions seem to be almost entirely suspended.

*Prurigo*, in its essential characters, resembles lichen, but differs from it in the greater size of its papulæ, the excessive itching, and the want of discoloration of the skin. It is always chronic, its duration varying from one to many months; its most common seats are the neck, shoulders, and pudendal lips, where the desire to relieve the pruritus by scratching is frequently irresistible. The papulæ are ordinarily very numerous, especially in young persons, and it is by no means unusual to observe several successive crops, new ones appearing as fast as the old ones heal. From the intolerable itching which attends them, they are apt to become torn by the nails, and replaced by small, blackish, circular scabs.

4. *Bullar Diseases.*—The bullar diseases, which are, properly speaking, only two in number—pemphigus and rupia—are marked by the formation of small bladders, of a circular figure, varying in size from that of a pea to that of a goose's egg, generally transparent, and filled with a serous, lymphy, or sero-purulent fluid, which is poured out between the dermis and cuticle. These small bladders attain their height in the course of seventy-two hours, when they commonly burst, and are succeeded by scabs, sometimes of considerable thickness. Their progress is generally chronic, and their duration varies from one or two weeks to several months.

*Pemphigus* is characterized by the formation of large bullæ, generally of a pale straw color, isolated, and occurring simultaneously on several parts of the body. In regard to its symptoms and duration, it may be divided into two distinct varieties, the acute and chronic. It is particularly apt to occur in adults and old persons, and is more common in males than in females.

In the *acute variety* of this disease there are generally well-marked constitutional symptoms, which, in the course of two or three days, are followed by the eruption of small, red, circular spots, which, rapidly increasing in size, soon turn to a more dusky hue. They are then transformed into bullæ, varying from the magnitude of a pea to that of a large hazel-nut, of a rounded shape, and generally encircled by a vividly red border, from one to several lines in width. Their number is variable, from a single one to many; they increase in size during the first twenty-four hours, and the contained fluid, which is at first thin and limpid, becomes yellowish, turbid, and even reddish. They reach their acme by the end of the third day, when they shrivel and dry up; or they burst, and leave small, thin, brownish crusts. The spots exposed by these crusts are of a dull red color, of an irregular form, isolated, and liable, from time to time, to slight exfoliations. The duration of each bulla is about seven days, and not unfrequently there are several successive crops of them on different parts of the body, so that the disease may be protracted for two or three weeks.

*Chronic pemphigus* differs from the acute principally in the greater ardiness of its progress, by the absence generally of the red areola, nd in the peculiar mildness of the antecedent and accompanying onstitutional manifestations. The bullæ, also, are generally somehat larger; and, in some rare cases, they cover the whole surface of he body, though they are for the most part confined to particular egions. In three or four days from their first development, they sually break, pouring out a thin yellowish or reddish fluid, so acrid, n some instances, as to irritate the surrounding parts. The sores hus exposed present a red, inflamed aspect; and, as the epidermis ries over them and exfoliates, new bullæ spring up in their neighborood and follow the same course. In this way the disease may last or several months or even years. Old people are most liable to it, specially those whose constitution is exhausted by debauch and inemperance.

*Rupia* presents several varieties; but as they differ from each other erely in their extent and intensity, it will be sufficient, for all pathoogical purposes, to consider them under one common head. The ffection, which is very analogous to ecthyma, usually occurs in a hronic form, its course being seldom run under several months. It s characterized by small, isolated, flattened bullæ, about the size of a hilling, with or without redness of the skin, and filled with a serous luid, which soon becomes opaque, puriform, or sanguinolent; and to hich succeed thick, rough, dark colored crusts, somewhat thinner at he circumference than at the centre. Ulcerations, either superficial r deep, generally exist under these scabs, which fall off in the course f a few days, and are speedily succeeded by cicatrization. Such, owever, is not always the progress of this disease. In some instances he sores remain open for a considerable period, forming scales which re removed as fast as they desquamate. Occasionally the disease isappears without the development of scabs.

Rupia sometimes terminates in gangrene. This is particularly apt take place on the thigh, breast, abdomen, and scrotum of young, achectic children. The bullæ in such cases are generally preceded y small livid spots, and they often form with great rapidity, their ontents being somewhat acrid and of a blackish color. In a short ime, the bladders give way, exposing extensive ulcerations bathed ith a bloody, ill-conditioned sanies, and encircled by livid and painul edges. Great constitutional disturbance usually attends this ariety of rupia, and not unfrequently it terminates in death. Cicarization is always slow, and the body is often disfigured with ugly cars.

5. *Vesicular Diseases.*—This class of cutaneous diseases is characterzed by the evolution of small vesicles, acuminated or globular, distinct r confluent, and occurring generally in irregularly circumscribed spots, he surface on which they appear being either of the natural color, or arked by inflammatory redness. The contents of the vesicles are at rst thin and transparent, afterwards milky and opaque, or even slightly urulent. The eruptions arranged under this group may occur in ny part of the body, are seldom serious, and may terminate either by

resolution, desquamation, superficial excoriation, or the formation of soft yellowish scabs. Their duration varies from a few days to several weeks, or even months.

*Miliaria* is an eruptive disease, generally, though not always, symptomatic of other affections, attended with profuse perspiration, and a feeling of heat and itching. Every portion of the body is liable to it, but the regions most frequently affected are the neck, breast, back, and inside of the thighs. Its duration is from one to three days. The vesicles, which are at first very small and transparent, are rarely confluent; but they often occur in irregular groups or patches, the surface over which they are scattered being either reddened, or of the natural color. When fully developed, as they generally are in the course of thirty-six or forty-eight hours, they are of a rounded form, pearly in their appearance, filled with a milky fluid, and about the size of millet-seeds. The eruption sometimes covers the greater part of the body, but usually it is widely scattered, and confined to particular regions. From eczema this disease may be distinguished by the rapidity of its progress, the shortness of its duration, and by the larger size and greater distinctness of its vesicles.

*Eczema* is an inflammation of the skin, non-contagious, and liable to occur on the scalp, ears, breast, scrotum, armpit, groin and pubes. Though usually limited to one or two spots, it sometimes occupies the whole surface of the body, and may be either acute or chronic. The disease is more frequent in warm than in cold weather, and in women than in men. Arising occasionally without any assignable cause, it is often induced by sudden vicissitudes of temperature, exposure to the hot rays of the sun, dry friction, and the internal or external use of mercury.

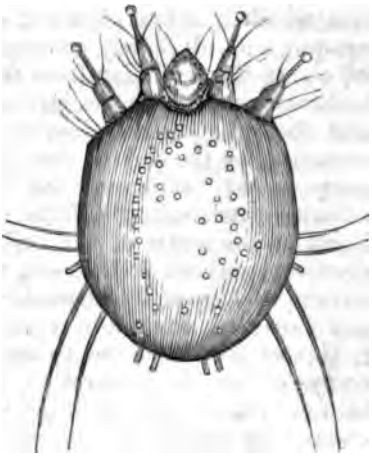
Eczema is characterized, at its commencement, by an evolution of very minute vesicles, closely crowded together, transparent, silvery, and reposing upon a surface which is either of the natural color, or else more or less red and inflamed. After having continued for some time, the disease either becomes chronic, or it terminates in the absorption of the fluid, or in superficial ulceration, followed by furfuraceous desquamation. Much itching and smarting often accompany this disease, and hence it is frequently mistaken for scabies. From this affection, however, it may be easily distinguished by its non-contagiousness, and by the agglomeration and peculiar shining aspect of its vesicles.

In violent cases of eczema, the vesicles become confluent, and are liable to break, giving vent to a thin, sero-purulent fluid, which gradually concretes into soft, yellowish scales, often of considerable size and thickness. These are frequently denuded, leaving always, on being detached, a crimson surface, from which exudes a reddish serosity, which follows the same course until the inflammation subsides, the scabs becoming every time thinner and lighter, and the sore less red and sensitive. Cases of this kind frequently last for several weeks, some of the vesicles drying as others appear; and they are usually preceded, as well as accompanied, by strongly marked constitutional symptoms.

When the disease runs into the chronic form, the skin being pertually irritated by the evolution of new vesicles, and the constant scharge of ichorous matter, continues deeply inflamed, at the same ne that it is very apt to become chafed and excoriated, especially out the joints. The eruption, in such cases, sometimes persists for onths, the secretion, in the meanwhile, going on in full vigor; at her times, however, the discharge is either very slight, or the part entirely dry, and covered with thin, soft yellowish scabs, which, on ling off, expose a cracked and slightly inflamed surface.

*Scabies* is an inflammatory affection, contagious, accompanied by an sect, and characterized by pointed vesicles, transparent at the sumit, of a light rosy tint, and filled with a thin, viscid fluid. By scratchg, these vesicles are easily broken, ıen their contents escape, and exse a corresponding number of ıall, red, inflamed specks, which freıently run into each other. The uption is sometimes very trifling, ıt in many cases it is very exnsive, covering a large portion of e cutaneous surface. It never, wever, appears on the face; and always most abundant at the xures of the joints and between e fingers, owing, doubtless, to the eat delicacy of the skin in these uations. In infants, the disease usually developed in four or five ys after exposure to the contaon; in adults, in from one to two eeks. A slight itching is first lt in the parts, which is invariably creased by the warmth of the bed, r sitting near the fire, or by stimuting food and drink, and, in pleoric habits, is sometimes almost tolerable. No fever attends this fection.

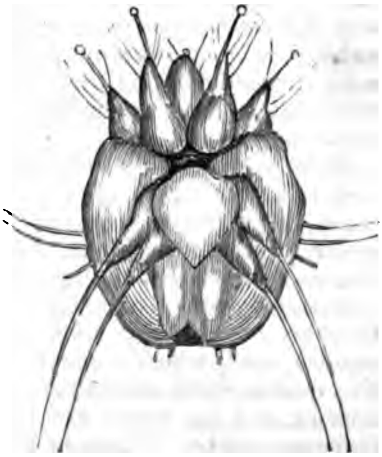
Fig. 108.



Itch insect.

It has been already stated that is disease is accompanied by an sect. Whether this is a constant currence is not fully determined, ıt that it is occasionally observed established beyond contradiction. he insect, the existence of which as long ago suspected, if not acually demonstrated, by some of the der physicians, is called the *acarus*, · *itch ciron*, and is seldom to be und in the vesicle, but almost

Fig. 109.



always in a small epidermic canal, which leads from it, and which is either straight or tortuous, and several lines in length. The acarus (Figs. 108, 109) is of a white, opaque color, and about the size of the sharp extremity of the finest needle, presenting, when seen through the microscope, the form of a tortoise. It has eight small feet, and the head is a perfect retracting sucker; the belly presents several dark colored spots, and on the back are to be seen a number of eccentric lines, placed at short intervals, and having the appearance of joints.

*Herpes* is characterized by distinct but irregular clusters of vesicles, which are set in close proximity upon a vividly red base, surrounded by intervals of sound skin. The spots thus formed vary in size from that of a guinea to that of the palm of the hand, and the vesicles from the smallest pin-head to that of a pea. The lymph of the vesicles, which is at first clear and colorless, becomes gradually milky and opaque, and ultimately concretes into thin brownish scabs, which fall off about the tenth day from the time of their eruption. Sometimes tedious ulcerations ensue, leaving strongly marked cicatrices; and now and then the disease disappears by desquamation, the fluid being absorbed by the end of the first week. In the zonoid variety, vulgarly called "shingles," the vesicles are aggregated into irregular oblique patches, in the form of a half belt. The patches generally begin at the centre of the body, whence they extend in an opposite direction, without ever passing the median line. Ringworm is another variety of herpes, the characters of which are so distinct as to render any particular account of it unnecessary.

Herpes lasts from one to several weeks, passing through a regular course of increase, maturation, and decline. It is generally very mild in its character, may be seated on any part of the body, and often coexists with other affections, either cutaneous or internal.

6. *Tubercular Diseases.*—The diseases arranged under this head are characterized by the development of small, solid, circumscribed tubercles, of a rounded or conical shape, of a reddish or purple color, generally isolated, and confined to particular regions. After having continued for some time, varying from a few months to several years, they either disappear, or terminate in ill-conditioned ulcers. The affections which properly belong to this division of the subject, and which are seldom seen except in tropical countries, are Greek elephantiasis, frambœsia, and lupus.

*Greek elephantiasis* is a chronic affection, characterized by soft, prominent tubercles, which are irregular in their shape, and of a red, livid color. In their size they vary between a pea and a walnut: they are either painful or indolent; and, as they grow older, they gradually assume a dirty bronze complexion, at the same time that they acquire a greater degree of hardness and density. When ulceration sets in, they become the seat of ill-conditioned sores, discharging a thin, sanious fluid, which concretes into thick, adherent, blackish crusts. The most common seat of the disease is the face, the ear, nose, shoulder, buttock, and leg, which are often hideously distorted, both from the immense number of tumors, the furrowed state of the skin, and the eat swelling of the subjacent cellular substance. Does elephantiasis nsist in a hypertrophied state of the cutaneous papillæ? This is ghly probable; but the question has not yet been determined by ssection. The disease is generally complicated with other affections, almost always incurable, is occasionally hereditary, and is met with discriminately in adults of both sexes.

*Frambœsia*, vulgarly called *yaws*, is a chronic tubercular disease, digenous in Africa, and extremely common in the West Indies. lthough contagious, it can only be communicated by immediate con- ct, and is incomparably more frequent amongst blacks than whites. he period which elapses between the reception of the virus and the mmencement of the eruption is not accurately determined, but pro- bly does not exceed several weeks. The disease affects the same per- n only once during life, and children are more obnoxious to it than dults.

The eruption, which is generally preceded by slight constitutional mptoms, and which appears successively on different regions of the ody, is characterized by minute flea-bite looking pimples, succeeded y irregular, prominent tubercles, which often present the shape, color, nd size of a raspberry, a circumstance from which the disease has btained its name. The vegetations thus formed are usually distinct t their summit, but almost always united at the base: they are firm, ndolent, and covered with thin, dry, adherent scales. Finally, after emaining stationary for weeks, and months, if not years, they in- ame, become soft and spongy, and give rise to deep, foul ulcers, from hich there is a constant discharge of a yellowish, acrid, and offensive uid, which soon concretes into thick scabs. Their most common eat is the head; they also occur, though less frequently, in the axilla nd groin, around the anus, on the scrotum, and on the pudendal lips. hey likewise appear on the shoulders, buttocks, and limbs; but the alp, forehead, and temples, scabbed and hideously disfigured, are the arts, of all others, which most frequently suffer.

*Lupus* is a malignant disease, and belongs to the class of epithelial ancers. It is seated, for the most part, on the nose, cheek, and chin, nd, if allowed to progress, successively destroys the cutaneous and ellular tissues, and finally the cartilages and bones. It usually com- ences in a small red point, which is hard and prominent, and appears affect only the more superficial layers of the skin. The progress f the tubercle is slow and gradual, a long time often elapsing before attains its full development. By and by, however, ulceration and abbing commence; the sore is bathed with sanious matter, its edges re raised and indurated, and its bottom exhibits a foul, livid aspect. he tendency of the disease is to spread, both in depth and diameter; ence it frequently invades a large extent of surface, and produces e most frightful ravages. The ulcer sometimes heals spontaneously; e part of the skin over which the disease has passed remaining hard nd red, like the cicatrice of a superficial burn.

7. *Scaly Diseases.*—The scaly diseases, located in the outer surface f the chorion, are characterized by the development of red spots, ele- ations, or blotches, over which the scarf-skin, dry, opaque, and thick-

ened, incessantly exfoliates and reappears, the process of renovation and decay sometimes going on for years. Easily distinguishable from the crusts which attend vesicular affections, they generally proceed in a slow and insidious manner, unaccompanied with much local or constitutional disturbance; and, although they are rarely dangerous, they are always very disagreeable, as they have a tendency, especially if protracted, not only to disfigure the skin, but seriously impede the movements of the joints. Five genera of lesions may be described under this order, namely, lepra, pityriasis, ichthyosis, psoriasis, and pellagra.

*Lepra* most commonly attacks the arms and legs, especially the superficial parts below the elbows and knees; it sometimes occurs on the hairy scalp, but seldom exclusively. Commencing in small, red, shining points, scarcely elevated above the level of the skin, it soon forms pretty large patches, often an inch and a half in diameter, of an orbicular shape, disjoined or confluent, slightly depressed in the centre, and surrounded by a florid, prominent circle, from one to several lines in width. The epidermic scales are at first thin, smooth, polished, and transparent; but, in the course of a few days, they are replaced by others, which are lamelliform, hard, tough, opalescent, pearly, or of a pale straw color. These scales fall off, and are incessantly renewed, the surface beneath being somewhat rosy and inflamed, smooth in recent cases, and occasionally deeply chapped in old.

This disease sometimes gets well spontaneously, the skin from which the scales are detached acquiring at first a peculiar grayish color, which sometimes persists for a considerable period afterwards. In the majority of cases, however, it slowly pursues its career, producing more or less thickening of the skin, and impairment of the locomotive powers. When leprosy is generally diffused, there is often considerable cutaneous inflammation, accompanied with extreme soreness, pain, and stiffness, sometimes amounting to such a degree as to render the motions of the joints impracticable, and confining the patient to his bed. The nails of the toes and fingers are frequently much thickened, opaque, of a dirty yellowish color, incurvated at the extremities, and very irregular on the surface; yet, notwithstanding this, there is rarely much constitutional disturbance.

*Pityriasis* is a superficial inflammation of the chorion, chronic, noncontagious, and attended with an exfoliation of the epidermis, in the form of very thin, irregular, whitish scales, which are reproduced in great numbers and with astonishing rapidity. Considerable pruritus often attends this affection, leading to an irresistible desire to scratch. Sometimes the cuticle comes away in a mealy, furfuraceous, or pulverulent desquamation; and, in the generality of cases, the chorion is singularly discolored, being sometimes of a copper tint, brownish, or almost black. The scales, whatever may be their size and form, are always dry, easily detached, and spread over a large surface, the affected part being often many inches in diameter, and interspersed with portions of sound skin. The most common seats of pityriasis are the scalp, eyebrows, breast, and epigastric region, together with the arms and shoulders.

*Ichthyosis* is a chronic cutaneous affection, appearing in large con- uous patches, which occasionally cover the greater part of the body. is characterized by the formation of thick, rough scales, of a gray- -white color, and almost horny texture, without pain, heat or pruri- , and without the deciduous exfoliations which belong to lepra and riasis. The whole skin seems to be deeply involved in this affec- n; and hence, in the advanced stages, it is generally in an extremely r, stiff, and uncomfortable condition, at the same time that it is atly hypertrophied and almost of gristly hardness, the different ers of which it is composed being no longer distinguishable from h other. In regard to their form, the epidermic scales present nost innumerable peculiarities. Sometimes they are of uniform ckness, and seem to be merely elevations of the common lozenges the cuticle; sometimes they are flat, thin, and imbricated; some- es they have short rounded necks, with broad irregular tops; and asionally, again, though very rarely, they sprout out in the form excrescences, of a horny texture, and most grotesque appearance. e quantity of these morbid excretions is, in some instances, immense, whole body being literally encased with them as with a shell. In l, inveterate cases, a considerable amount of calcareous matter is quently poured out, both upon the surface of the scales, and in the ervals between them.

The color of the scales varies not only in different subjects, but quently in different parts of the same individual. As was before ted, most of them are of a grayish-white; but, in many instances, ey are brownish, greenish, or blackish. They have also been known exhibit a shining, pearly aspect, and to be surrounded by a blackish oking border.

During the warm weather of summer, this disease sometimes nearly appears, the scales dropping off in large quantities, especially at ght. It is usually aggravated by arid states of the atmosphere, and always most troublesome during the severe cold of winter. Un- asant sores sometimes attend ichthyosis, more or less painful, urient, and discharging a thin, acrid humor: the general health is ually much impaired, and the whole body occasionally emits a culiar, fishy exhalation. Sometimes the patient is harassed with stular eruptions.

Ichthyosis generally begins very early in life; and, in a number of stances, it has been known to be hereditary. The most common seats the disease are the outer regions of the extremities, both upper and wer, the sides of the trunk, and the shoulders. The flexures of the nts and the inner surface of the thighs are seldom affected.

*Psoriasis*, vulgarly called the *scaly tetter*, consists of solid, inflamma- ry elevations of the skin, forming various-sized patches, isolated or ited, covered with thin, white, shining scabs, and commonly accom- nied by slight constitutional symptoms. The eruption sometimes ects a peculiarly tortuous, serpentine shape: in other instances, ecially when it breaks out on the lips, it pursues a circular direc- n, ring after ring forming regularly beyond the surface last attacked. e chorion is generally somewhat rosaceous, and, in bad cases, considerably thickened and chapped: a very disagreeable itching, attended occasionally with a good deal of pain, is pretty constantly present; and the scales, seldom very adherent, are frequently detached and reproduced. Sometimes the eruption is entirely confined to the limbs; at other times it covers the whole body; and, in such cases, the patient appears to be literally inclosed in a squamous envelop. Occasionally, the nails split, become yellow, and at length fall off; and the least movement frequently produces rents in the skin, followed by a flow of blood. Occurring at all ages, it is liable to disappear, and recur at certain seasons; in some individuals it never entirely ceases.

The fifth and last disease to be noticed under the present head is *pellagra*. This is very common in certain districts of Italy, where it sometimes prevails epidemically, especially during spring and summer, but is entirely unknown in this country. Adults alone suffer, and both sexes are equally liable to it. Its course, which is always chronic, lasts from one to several years, the complaint becoming annually more and more aggravated, until the unfortunate patient, harassed and disfigured, finally sinks beneath its blighting influence. Dissection always discloses extensive lesion of the internal organs, particularly of the alimentary canal.

More or less constitutional derangement usually precedes this affection, which manifests itself by small, red, shining spots, accompanied with slight tumefaction of the skin, together with a sense of fulness and tension. By degrees, the color of these spots becomes deeper; their surface is covered with thin scales; and, as they augment in size, they unite, and form large, irregular-shaped patches. The skin, meanwhile, is not only considerably thickened, but disfigured with deep rents and fissures. After remaining in this state for some time, the scales gradually drop off, disclosing a red, glossy surface, from which there is a constant bran-like exfoliation of the epidermis. The neck and limbs are the parts most usually affected.

8. *Syphilitic Diseases.*—The disorders comprehended under this appellation are caused by the influence of the venereal virus, and manifest themselves under at least six varieties of form, the exanthematous, vesicular, pustular, tubercular, papular, and scaly. They are occasionally *primary;* that is, they appear simultaneously with the affection of the genital organs; but, in the great majority of cases, they are not developed until some time subsequently, generally, not under a few months; and they are then said to be *consecutive.* The eruptions appertaining to this group usually pursue a chronic course, are circular in their form, and present a characteristic copper color: though occurring in all parts of the body, they are principally observed on the forehead, nose, cheek, back, and shoulder, and are attended with thin, grayish scales, or with hard, thick, greenish scabs.

In the *exanthematous* form, the spots are of a circular shape, and about the size of a quarter of a dollar: they are almost always situated on the trunk and extremities, are of a dark copper color, do not disappear under pressure, are never confluent, and generally terminate by a slight exfoliation of the epidermis. There is a variety of this eruption, which is characterized by small, irregular, grayish spots, of a deeper red than the preceding, more transient, slightly confluent, and disappearing, though slowly, under the pressure of the finger.

The *vesicular* form is extremely rare. It begins in minute, circumscribed pimples, scattered over different parts of the body, to which succeed small vesicles, filled with a transparent fluid, and surrounded by a red, copper-colored areola; their progress is very slow, and their contents are either absorbed, or they concrete into thin scales, which, falling off at different intervals, leave the surface of a dingy, yellowish hue. The vesicles are sometimes extremely numerous, covering nearly the whole body.

The third form of syphilitic disease is the *pustular*. This variety, as the name indicates, is characterized by the presence of small tumors, containing an ichorous, serous, or purulent fluid. Their size and shape are subject to considerable diversity. Occasionally, they are as large as a hazel-nut; but, under ordinary circumstances, they do not exceed the volume of a common pea, and, indeed, are seldom so large. In their shape, they are sometimes conical, sometimes oval, sometimes pediculated, sometimes rounded, and sometimes flattened, with a minute central depression. Now and then, all these varieties are observable in the same individual. Their number is often immense, hundreds being scattered over a small extent of surface; and, as they form successively, they may be seen and studied in every stage of their development. Each pustule reposes upon a hard, copper-colored base: its internal structure is not known: it appears to be not unlike that of smallpox.

After remaining for a short period, the contents of the pustules escape, concrete, and form hard, thick scabs, of a dark color, pretty firmly adherent, and sometimes circularly furrowed. In mild cases, the scabs soon fall off, and leave merely a chronic induration, a livid or grayish stain, or a slight cicatrice: in severe ones, on the contrary, deep, circular ulcers are exposed, with a foul, grayish bottom, and a hard, purple, and regularly-defined margin. In cases of the latter description, the scabs are frequently renewed, and are finally replaced by round, indelible scars.

In the *tubercular* form—the most frequent, perhaps, of all—the eruption consists of small, red, copper-colored eminences, varying in size between that of a mustard-seed and an olive. Of a rounded, flattened, or conoidal shape, they are either isolated, assembled in groups, or arranged into perfect circles: they are smooth and polished, produce little or no pain, and become covered, in a short time, with a dry, scaly incrustation, which is generally reproduced as fast as it falls off.

In the more aggravated forms of this variety of syphilis, the tubercles are inordinately large, prominent, of a deep violet hue, from three to six lines in length, and encircled by a well-marked, copper-colored areola. After continuing thus for some time, varying from a few months to several years, they become painful, inflame, suppurate, and are replaced by deep, foul, irregular ulcers, reposing upon a hard, purple base. A thick scab usually covers these erosions, which is repeatedly renewed, showing, each time that it is detached, that the sore is extending its ravages. When the tubercles are numerous, the ulcers, running together, often acquire a frightful size, and, on healing, leave disfiguring cicatrices.

*Papular* syphilis is characterized by the occurrence of small, hard, solid elevations, containing no fluid, and terminating almost always in desquamation, seldom in ulceration, or in the formation of scabs. There are two varieties of the affection, one of which is acute and primary, the other chronic and secondary.

In the first variety, which sometimes accompanies gonorrhœa, the eruption appears simultaneously on different regions of the body, and is completed in about forty-eight hours from the time of its first invasion. The papulæ are extremely small, disjoined or grouped, of a red copper color, and of a slightly conical shape, being surrounded, here and there, by violet areolæ, which are often confluent, and give the surface a characteristic yellow tinge. Ulceration rarely attacks these papulæ: they disappear in a short time, and are followed by a furfuraceous desquamation of the cuticle.

In the other variety, the eruption is developed in a slow and successive manner, being announced by small yellow spots, which are particularly numerous on the forehead, scalp, and extremities. The papulæ, which are of a light copper color, are larger than the preceding, flat, of the size of small beans, grouped, and devoid of an areola. In time, the summit of each elevation becomes covered with a dry, grayish pellicle, which is regenerated as fast as it desquamates, until the disease finally entirely subsides. Meanwhile, the skin between the agglomerated papulæ undergoes important changes; it assumes a dingy yellowish color, has a dry, shrivelled aspect, and is the seat of a constant exfoliation of the cuticle.

The sixth form of syphilitic disease is the *scaly*, which manifests itself, as the name imports, by dry, grayish imbrications, situated on small, copper-colored elevations. This variety, which is always consecutive, persists for a long time, and terminates by desquamation. The eruption, in the plurality of cases, appears in patches, which, although they may occur on all parts of the cutaneous surface, are most common on the forehead, scalp, and face. They are from four to eight lines in diameter, of an irregularly rounded shape, ordinarily isolated, smooth, polished, and somewhat elevated; each is covered with a thin, hard, whitish scale, which is very slightly adherent, and which, on falling off, exposes a small, shining, copper colored eminence.

9. *Stains.*—There are certain discolorations of the skin, which, from the frequency of their occurrence, rather than from any pathological interest, require to be mentioned in this place. Of these, the principal are ephelis, lentigo, albinism, and nigritism. They are seated in the vascular network of the skin, and depend upon some alteration of the coloring matter; some of these stains are congenital, and it is a singular fact that they seldom affect the whole cutaneous surface. Their duration varies from several weeks to many years.

*Lentigo*, usually called *freckles*, is characterized by yellowish, fawn-colored spots, varying in size from a pin-head to that of a five cent piece; they are most common on the face, neck, chest, and hands, in persons with light eyes and red hair; are often congenital, and last through life. When the spots are very numerous, they sometimes run into each other, and thus form large, irregular-shaped patches.

In *ephelis*, the stains are of a yellow saffron color, very irregular in shape, and much larger than in lentigo. Their most common situation is the neck, the anterior part of the trunk, and the inside of the thigh; they are never observed on the face, except during pregnancy, on which they are a frequent attendant. The spots, which are often preceded and accompanied by considerable itching, are at first of a grayish color, small, isolated, and rounded; by degrees they assume a yellow tint, augment in size, and unite into large, irregular patches; their duration varies from a few days to several months, and their disappearance is frequently followed by slight exfoliation of the epidermis.

The skin is sometimes converted into a dead, milky-white color, constituting what is termed *albinism*. This change, which is confined to no particular race, depends not upon the absence of the pigment, but rather, I apprehend, upon some modification of its component elements. Persons who present this peculiarity differ, in many respects, from ordinary individuals. Their whole organization, both mental and physical, seems to be imperfect; the body is covered with a soft, silky down; the hair is often of a snow-white color; the eyes are feeble, and unable to bear the light; and the iris and choroid are of a light rosy tint, from the absence of black pigment.

There is a variety of albinism, which is limited to particular regions of the body, usually the head and trunk, to which the term *vitiligo* has been applied. It commences in small, milk-white spots, which go on enlarging until they sometimes cover the whole surface. The spots are generally oval or rounded, and now and then they have an irregularly striated arrangement. When the disease occurs on the scalp, axilla, and pubes, the hair participates in it, and becomes deprived of its natural color. Negroes who exhibit this peculiarity are called piebald.

*Nigritism* is the term employed to designate the reverse of the condition just described. The affection is generally local, appearing in small, irregular-shaped patches, from one to several inches in diameter; the parts of the body most subject to it are the genital organs of the male, and the nipple of the female. The face is also sometimes the seat of it, especially during pregnancy.

It is well known that nitrate of silver, if administered for a long time, has the effect of imparting a gray slate color not only to the skin, but also to accidental cicatrices, the conjunctiva, and to the mucous membrane of the alimentary tube. The discoloration generally remains during life, and is always most conspicuous on the surfaces exposed to the light and air, as the face, neck, and hand. How this change is produced, the present state of our knowledge does not enable us to explain. The most plausible conjecture is that the coloring matter of the skin has a special affinity for the substance in question, by which they combine with each other, at the same time that they undergo some alteration in their properties. What gives countenance to this idea is, that the color remains after boiling, and that no impression can be made upon it by medicine. Mr. Brande asserts that he has detected oxide of silver in the stained organs. It should be added that the discoloration produced by this substance is occasionally of a dirty bronze appearance.

## SECTION II.

### NAILS.

WHEN a nail is torn away, it is gradually regenerated, the period required for this purpose varying from three to six months, according to its size, and the violence inflicted upon the secreting apparatus. Many years ago, I received a severe contusion on my left thumb, the consequence of which was an exfoliation of the corresponding nail. As the old nail became detached, a new one gradually formed, which, in six months from the time of the injury, had acquired its full size and development.

Inordinate *length* of the nails is of very common occurrence, and would be still more so, were it not for the constant paring to which they are subjected. Left to themselves, they sometimes grow to the distance of three, four, or five inches, pursuing a tortuous, spiral course, so that they occasionally bear a much closer resemblance to claws than nails. Their thickness, under such circumstances, is generally considerably augmented, from the superaddition of lamellæ, which often overlap each other, like the scales of a fish. The extension and thickening of the nails form a prominent feature in ichthyosis, leprosy, and elephantiasis. The nails, in these diseases, after having acquired a certain length, sometimes fall off, and are reproduced, though seldom perfectly. In Polish plait, the nails both of the fingers and toes often acquire a great size, and a yellowish, livid, or black complexion.

The nails are sometimes absent, as a congenital defect. More frequently, they are unusually small, or developed imperfectly, their place being supplied by thick, horny cuticle. On herpetic persons we often find them very short, scaly, and of a thick, rounded, button-like form. In strumous subjects, they are sometimes deeply grooved, enlarged, and of an indurated, horny consistence. In protracted paralysis, the nails grow very slowly and imperfectly, from deficiency of nervous energy.

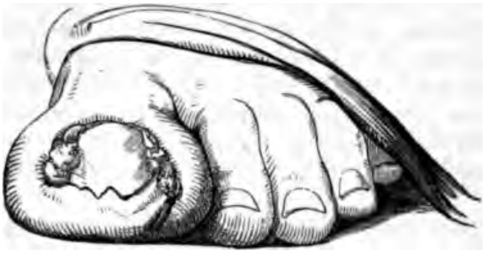
A vicious situation is occasionally observed. Thomas Bartholin[1] has recorded an instance where the nails occupied the anterior extremity of the metacarpus, the fingers being absent. In other cases they occupy the lateral surfaces of the fingers. In monsters, the nails of the fingers are sometimes consolidated, and the same deformity has been observed in adults. In pulmonary phthisis, the nails are frequently incurvated.

---

[1] Hist. Anat., t. i. 291.

The ungueal matrix is subject to a peculiar disease named *onyxitis.* It commences in a circumscribed swelling of the ungueal matrix, with pain and deep redness. In a short time, a thin, ichorous fluid issues from the cleft at the root of the nail, and at last the soft parts give way. The ulcer is at first very small, but gradually extends, until it finally involves the whole of the ungueal matrix, together with a portion of the dermis immediately around it. The surface is brown and glossy, the margin thin and sharp, the discharge fetid and irritating. The pain is sometimes intense; at other times the disease is more indolent, and accompanied with little uneasiness. The nail is formed very imperfectly; it loses its natural shape and color, becomes irregular, dry and black, and at length falls off. When this happens, it is seldom completely regenerated. The surrounding skin is tense and livid, and the affected extremity assumes a bulbous appearance, often exceeding double the normal size; in cases of long standing, the disease sometimes invades the subjacent bone. Onyxitis occurs chiefly in young persons, and attacks the thumb more frequently than the fingers or toes. It may continue for years.

Fig. 110.



Onyxitis, affecting the great toe.

## SECTION III.

### HAIRS.

1. Most of the lesions of the hairs are directly referable to inflammation of their follicles. In general, the *inflammation* pursues a chronic course; but what particular changes the structures in question undergo, is by no means ascertained. It is altogether probable that the piliferous follicles are considerably swollen and injected, and that their power of secretion is either suspended, or, at all events, very greatly modified; so that the stem, instead of presenting its normal characters, is variously altered, both in its consistence, its length, its thickness, and, above all, in its color.

2. The *Polish plait*, a disease endemic in Poland, Lithuania, and Tartary, is an inflammatory affection. It generally attacks an immense number of piliferous follicles, which in a short time acquire an extraordinary size, rising above the level of the skin, being painful on the slightest touch, and exuding a large quantity of viscid, brownish, and offensive matter, by which the hairs are matted and glued into inextricable tangles, of great length. Even the stems are swollen and

increased in thickness; their cavity is also larger than in the sound state, and their areolar texture is rendered unusually distinct. This disease generally appears during the autumnal months, is observed chiefly in the lower classes, and is often extremely obstinate and persisting. Although the hairs of the head generally alone suffer, yet those of the beard, axilla, and pubes, are sometimes similarly affected. It has been asserted that the hairs occasionally bleed in this disorder, but this is still a litigated point. The late Professor Meckel, of Halle, carefully injected the scalps of two persons that died while laboring under the Polish plait, and in neither did he succeed in throwing any of the fluid into the matted mass or horny portion of the hair. These experiments, however, are far from being conclusive; for it is obvious that vessels might have existed in the parts referred to, and yet, owing to their extreme minuteness, the artificial fluid might have failed to reach them.

3. When the hairs are plucked out, they are always regenerated, provided the secreting pulp remains unimpaired. When this structure is injured, the new growth is proportionably slow and imperfect. In old age, the piliferous sacs become *atrophied;* they lose their energy, diminish in size, and are at length completely annihilated. The same phenomenon occurs in certain diseases, as bilious fever, scarlatina, psoriasis, and secondary syphilis. The falling of the hairs is often temporary, and probably depends upon some transient disease of the piliferous follicles. A few years ago a friend of mine, after recovering from a severe attack of scarlatina, lost every hair on the body; in a few months new ones sprang up, and in time acquired all the characters of the former crop. Persons seldom grow bald all at once. The crown of the head is generally affected first, whence the depilation gradually extends in different directions. The piliferous follicles in this affection seem to die gradually; for, after the original hairs have dropped off, a new crop frequently appears, consisting of a thin, soft, whitish down, evidently formed by feeble attempts at reproduction.

4. *Hypertrophy* of the hair is sometimes observed. It is most frequent on the head, but may also occur on other parts of the body, as the beard and pubes. The most remarkable case of hypertrophy of the hair of the head, of which I have any knowledge, occurred in a friend of mine, a young lady about twenty years of age. From her earliest youth she was subject to cephalalgia, but did not appear otherwise unwell. Her complexion was unusually fair, her eyes light, and her hair of a flaxen hue. In consequence of her constant headaches, the hair was commonly kept short; but, to effect this, as it grew with extraordinary rapidity, it was necessary to cut it every few weeks. Within a year of her death, her general health gradually declined without any assignable cause, save the astonishing development of the hair, attended with severe cephalalgia. During the last three months, the hair, although it had been cut only a short time before, reached nearly down to the heel, and had a soft, oily feel: the pain in the head increased in violence, the countenance became blanched and almost transparent, and she died gradually exhausted,

having, within a few days of her dissolution, exhibited symptoms of acute phrenitis. On examination after death, the only remarkable circumstance observed was a slight accumulation of water in the ventricles and at the base of the brain. It is impossible to doubt that this abnormal growth of the hair depended on hypertrophy of their follicles, constantly inviting an excess of blood to the head at the expense of the rest of the system. This is proved by the extraordinary development of the hair, by the obstinacy of the cephalalgia, and by the symptoms which were present during the last few months of the young lady's illness. The particular state of the piliferous follicles was not ascertained.

Scarcely less extraordinary is the development of the beard in the female. Of this species of hypertrophy not a few examples are recorded by authors. A remarkable one came under my own observation some years ago. The woman, who is the mother of a numerous offspring, is seventy-eight years of age, and has always enjoyed excellent health. The sides of the face, chin, and lips are all thickly covered with coarse hair, which she is obliged to shave off regularly once a week. Her whole aspect is remarkably masculine; and, but for the length of the hair of the head, she might be easily mistaken for a male. The hair of the pubes sometimes attains an extraordinary development, forming long, thick tufts; and similar appearances have been witnessed on the shoulders and buttocks.

The hair often loses its normal form, hanging about the head in soft, straight locks. Cases have occurred in which it could not be kept in curl if there was the slightest indisposition; and, on the other hand, an instance is narrated in which it always curled in a fit of the gout.

There are cases, again, wherein the hair, in consequence of some imperfection in its growth, becomes remarkably brittle. A curious case is recorded by Mr. Mayo[1] of a young lady, whose hair, without any assignable cause, suddenly broke, at a quarter of an inch from the head, and fell off in large locks. This singular process was repeated every three or four weeks. She was subject to severe headache, but in other respects her health appeared to be perfectly good.

5. A change of *color* of the hair is a natural consequence of old age, but it also occurs in different diseases, and from the influence of the depressing passions, such as grief and fear. What alterations the pilous system undergoes, under such circumstances, we have no means to determine. The discoloration, though for the most part gradual, has been known to take place in the course of a few hours. When caused by age, it generally begins at the loose extremities; the same fact is observed in animals which change their complexion for the winter. The restoration of color, on the contrary, always commences at the root.

6. An *accidental* development of hairs is not uncommon. This is often seen upon congenital moles, as well as upon parts of the skin that have been for a considerable period in a state of irritation. As occurring in the stomach, bowels, and urinary bladder, numerous cases

---

[1] Outlines of Human Physiology, p. 468.

have been recorded by Haller and other authors. They have also been found in the gall-bladder, in cutaneous tumors, and in the ovary. In the latter organ they generally coexist with dropsical accumulations, carcinoma, or extra-uterine fœtation, and hence they are almost always accompanied by adipocirous matter, by teeth, and by pieces of bone. In most of the situations here specified, though not in all, they perfectly resemble the normal hairs, both in their color and structure, being composed of distinct roots and stems. Concerning their mode of origin, however, we have no positive information.

# CHAPTER XI.

## NERVOUS SYSTEM.

I. *Lesions of the Brain.*—Wounds.—Encephalitis.—Suppuration.—Abscesses.—Gangrene.—Softening.—Chronic Inflammation. —Induration.—Ulceration.—Sanguineous Effusions.—Hypertrophy and Atrophy.—Tubercles.—Melanosis.—Encephaloid.—Cartilaginous Formations.—Calcareous Deposits.—Cysts and Hydatids.—II. *Lesions of the Cerebral Envelops.*—Inflammation of the Dura Mater.—Suppuration.—Fibrous Tumors.—Bony Deposits.—Hypertrophy of the Glands of Pacchioni.—Arachnitis.—Hydrocephalus.—Tubercles.—Diseases of the Pia Mater.—III. *Lesions of the Spinal Cord.*—Inflammation. —Heterologous Formations. —Hydro-rachitis. —IV. *Lesions of the Nerves.* —Restorative Power. —Neuritis. —Suppuration.—Ulceration.—Hypertrophy and Atrophy.—Diseases of the Nervous Ganglia.

## SECTION I.

### BRAIN.

THE brain is subject to various forms of disease, amongst which acute and chronic inflammation, suppuration, softening, ulceration, sanguineous effusions, and new growths, are the most common and important.

1. *Wounds.*—Various experiments have been instituted by pathologists, with a view of ascertaining whether wounds of the brain and spinal marrow are susceptible of cicatrization; but with so little success that the knowledge which has been thus obtained is comparatively unimportant. The cause of this is to be found chiefly in the fact that the animals, the subjects of the experiments, almost always die at an early period after the operation, from the effects of acute encephalitis, thus allowing the parts no chance of healing. If life be preserved for a few days, the edges of the wound are found to be greatly injected with blood, of a deep rose color, and considerably augmented in density, the induration often extending to the distance of three or four lines into the surrounding tissue. With these changes is usually seen a small quantity of soft, reddish lymph, which is smeared over the

incised parts, and serves as the basis of the future granulations, which always spring up, if the animal survive the operation a week or a fortnight. Not unfrequently the cerebral tissue, instead of growing hard and firm, acquires an unusual degree of softness, from the infiltration of serosity, pus, or blood, or from the influence of all these fluids united. In other cases, these two characters are combined, the edges of the lesion being dense and indurated, whilst the parts immediately around them are soft, boggy, and permeated with liquids.

Appearances of scars, sometimes of very large size, are not unfrequently discovered in the brain after death, for which pathologists have found it extremely difficult to account; that they are formed, however, by the same kind of mechanism as in the other textures of the body, is by no means improbable. Thus, when, for example, the cerebral substance is lacerated by an effusion of blood, the fluid, as will be subsequently shown, occasionally becomes organized and incased in a distinct cyst, which either remains during life, or, as is perhaps more generally the case when the extravasation is not very copious, it is acted upon by the absorbents, by whose influence it is gradually destroyed, or reduced to a dense, fibrous texture. When this has been accomplished, there is generally to be found a true linear cicatrice, of a light citron color, and much harder than the cerebral substance, although softer than the scars which we find in most of the other tissues. These cicatrices have usually a laminated arrangement, with a thickness from the third of a line to the eighth of an inch or more; yet, not unfrequently, they are perfectly cellular, moist, vascular, and filled with serous fluid.

2. *Inflammation.*—Encephalitis, cerebritis, or inflammation of the brain, seldom exists as a primary, idiopathic, or uncomplicated affection: most commonly it is the result of previous disease, as fevers, especially such as are of an eruptive nature, apoplectic effusions, tumors, and external injury. When produced by violence inflicted on the scalp and cranial bones, the inflammation is generally limited in extent, although intense in degree. It never involves the whole organ at once; for such a condition would be incompatible with the continuance of life. The disease may occur at all ages, and in all parts of the encephalic mass, although some are more obnoxious to it than others.

The anatomical characters of the inflamed structure vary according to the duration and intensity of the disease. At first, there is merely a slight increase of vascularity, with a reddish rose-colored state of the cerebral substance. When sliced with a sharp knife, it presents a multitude of small red points, which give the section the appearance as if it were strewed with particles of vermilion. The capillaries are everywhere greatly injected; and so firmly is the blood crowded into them that it is with difficulty removed by ablution. Not unfrequently small ecchymoses are met with, caused, no doubt, by a rupture of minute vessels, in consequence of the violence of the inflammatory action. Although the extravasation often occurs in distinct spots, yet it occasionally presents itself in irregular lines or streaks, which, when numerous, give the cerebral substance a singularly mottled aspect, with various tints of red, the color being usually more florid in the cortical than in the fibrous texture.

At this early period of the inflammation, there seems to be no distinct line of demarcation between the sound and diseased parts: in most cases they run insensibly into each other, the redness gradually declining in intensity as we proceed from the centre of the irritation towards the periphery; and, although the affected structure is less tenacious than in the healthy state of the brain, it is firmer than usual, from the turgescence, apparently, of its vessels.

As the disease advances, the vascular injection becomes more and more strongly marked, and the reddish color which was displayed in the earlier stage, gradually deepens, until it acquires a brownish, claret purple, and occasionally even a greenish or dusky yellowish shade. With this augmented capillary turgescence, amounting almost to complete obstruction, the part becomes preternaturally soft, and assumes that peculiar alteration of character which has been described under the name of cerebral mollescence.

The substance of the brain, when thus affected, has entirely lost its natural properties: it has a humid, macerated appearance, from the infiltration of serosity, purulent matter, or blood, and is often converted into a soft, grayish pulp, bounded by a hard, vascular border, exhibiting all the signs of the first stage of inflammation. Several such disorganized spots are sometimes met with, either in close proximity, or separated by considerable intervals. When the affected structure is pervaded by numerous globules of pus, it is very apt to have a citron hue, and then constitutes what has been termed the *yellow softening* of the brain; from which the *red softening* differs only in being of a deeper color, the broken down pulp varying from a florid to a claret tint, with intermediate shades of violet, brown, chestnut, or cineritious.

The different appearances now described are not unfrequently met with in the same diseased portion. Thus, we may have the reddened, indurated state at the circumference; next, that of serous infiltration; and, finally, that of purulent softening in the centre. The pus always occurs here, as elsewhere, at first in disseminated globules, and afterwards, if the patient survive long enough, in distinct foci. The red and yellow softening are frequently combined, one portion of the inflamed structure presenting the bloody, the other the purulent infiltration.

It has been already stated that the affected part, in the early stage of encephalitis, is, in the generality of cases, somewhat harder than it is in the normal condition. The degree of consistence is subject to remarkable variations, running through all the intermediate grades, from an indurated, firm, and elastic body to one of almost perfect fluidity. The softened mass, in such cases, is generally surrounded by the hardened, which is itself intimately, and, for the most part, insensibly blended with the healthy cerebral tissue.

In the early stages of encephalitis the red color of the inflamed part cannot, as was before intimated, be removed by ablution, nor can the engorged vessels be filled with minute injecting matter, thus presenting a striking analogy with what takes place, under similar circumstances, in the serous and mucous membranes, as well as in the liver, spleen, and kidney.

The vascular and serous envelops of the brain are not unfrequently affected in this disease. When the cerebritis is located superficially, the inflamed portions always adhere to these tunics with unnatural firmness, especially in the early stages of the complaint; and hence, in attempting to peel them off, fragments of cerebral substance, traversed by red and distended capillaries, generally follow. The vessels of the pia mater, under these circumstances, are commonly much engorged; the arachnoid is opaque and adherent; and the intergyral hollows are filled with sero-albuminous matter, with blood, or even with pus.

From this rapid sketch of the anatomical characters of acute cerebritis, it will be perceived that the first effects of the disease consist simply in capillary engorgement, in punctated or striated redness, which is usually more conspicuous in the cortical than in the fibrous texture, and in increased hardness, varying in degree according to the intensity of the disorder; and, secondly, that, if the inflammation be allowed to go on unrestrained, it finally passes into mollescence, in which purulent, bloody, and cerebral matters are in general intimately blended together, forming a mass of a semi-liquid consistence, and of a light brownish color, with various shades of yellowish, grayish, claret, or even greenish.

Although all parts of the brain are liable to acute cerebritis, yet there are some which are much more frequently affected than others. The most common seat seems to be the cineritious texture, the great vascularity of which strongly predisposes it to inflammation and its consequences. Thus, of forty-six cases of this disease, collected by Lallemand, the gray substance was the principal seat of the inflammation in thirty-three, and the white only in eight. The surface of the convolutions, which consist entirely of cortical matter, was affected in sixteen cases; the striated bodies and optic couches, in which the same substance predominates, in thirteen; and the Varolian bridge, which is made up chiefly of fibrous matter, only in four. Some influence must, also, no doubt, be allowed to the greater extent of surface of the gray substance, and to its intimate connection with the pia mater, which can seldom be much inflamed without the disease being propagated to the contiguous parts of the brain.

Acute encephalitis usually reaches its full height within three or four days from its invasion. When partial, the patient often recovers; but should it occupy a large extent of surface, it generally proves fatal in a very short time, not unfrequently, indeed, in thirty-six or forty-eight hours.

3. *Suppuration.*—Inflammation of the brain not unfrequently passes into suppuration, the matter occurring either in the form of small yellowish globules, or in that of abscesses. The most common seat of the disease is in the anterior half of the cerebral hemispheres, on a level with the great commissure; no portion, however, of the cerebro-spinal axis is exempt from it, cases of it having been found in the

cerebellum, posterior lobes of the cerebrum, spinal cord, medulla oblongata, Varolian bridge, and even the quadrigeminal tubercles and pineal gland.

Collections of purulent fluid present themselves under several varieties of form. In one, which may be denominated the *undefined abscess*, the matter is contained in a cavity, the walls of which are formed by the surrounding brain, and partly, perhaps, by its membranes, if it be seated superficially or near the ventricles. The inner surface of the abscess, though occasionally smooth and even, is generally rough, granulated, and shaggy, the purulent fluid adhering to it with various degrees of tenacity. The cerebral tissue immediately around the cavity is usually remarkably sound, there being seldom any sign of inflammation, induration, or softening. The size of these collections is variable. Not unfrequently they are as large as a walnut; but, for the most part, they do not exceed the volume of a pea, a grape, or an almond. Occasionally, almost the whole of one hemisphere is converted into a soft, purulent mass.

The second variety of abscess is the *encysted*. The pus in this species, as the name indicates, is contained in a distinct capsule, formed by the deposition of plastic lymph. The capsule is, at first, soft, delicate, and easily torn: in time it becomes dense, remarkably firm, and completely organized, vessels ramifying through it in great numbers from the circumjacent cerebral tissue. The outer surface of the sac at this stage is rough and flocculent; the internal is smooth, of a rose color and somewhat villous, like the mucous coat of the stomach. Its thickness rarely exceeds that of the pericardium; but instances occasionally occur in which it is several lines thick. In cases of very long standing, the cyst is often very firm and indurated, from its conversion into fibrous, cartilaginous, or osseous texture. Under such circumstances, it is not unusual to find it composed of several folds, intimately connected with each other, but differing remarkably in their color, density, and thickness, the softest being generally internal, as if they had been secreted by the others. Cases, again, occur in which the cyst is divided into numerous cells, formed by hard, grayish, intersecting bands.

The object of these cysts evidently is to serve as barriers to the extension of the pus which they inclose. Rudiments of them are occasionally found as early as the end of the first week; and it is not uncommon to see them perfectly organized at the expiration of a month. Patients thus affected not unfrequently live for a long time before the brain is so far destroyed as to render the continuance of life impossible. Horner mentions an instance in which the interval between the infliction of the injury—a pistol wound—and the fatal termination was nearly twelve months; Sir Everard Home, one of nineteen months; and Dr. Copland, one of upwards of three years. Similar cases are to be found in the writings of Sir Astley Cooper, Hennen, and other surgeons. When the cyst finally becomes the cause of death, it is by exciting fresh inflammation in the surrounding cerebral texture; or it may, acting in the capacity of a foreign body, excite inflammation in the arachnoid membrane, and destroy life by the consequent effusions.

Abscesses of the brain, however, do not always terminate fatally; for numerous cases occur in which there is every reason to believe that the pus is absorbed, and the cavity of the cyst gradually obliterated by the approximation of its walls. The opinion, at all events, derives confirmation from the appearances of the large cicatrices which are so often found in the brains of old persons, and from the intersecting bands which are occasionally seen uniting the sides of encysted abscesses.

In respect to its appearance, the pus found in the brain differs in no essential particular from that in other parts of the body. In the generality of cases it is of a pale straw color, thick and inodorous; not unfrequently, however, it is greenish, reddish, or dirty white, thin, and remarkably fetid: this is particularly the case in young subjects who die from the extension of inflammation of the ear to the brain. In scrofulous persons, the pus is generally very thick and tenacious, from the admixture, probably, of plastic lymph.

Suppuration of the brain sometimes takes place with great rapidity, as in two or three days. Laennec asserts that he has known pus to form here in less than twenty-four hours. The purulent fluid, when encysted, often manifests a tendency to pass from its original situation to some other. Thus, when it is seated in one of the hemispheres, it may work its way gradually to the surface, or into one of the ventricles, destroying occasionally, in the former case, the lining membranes, with the contiguous bone. In 1827, I examined the body of a stout athletic man, forty years of age, who died nearly three weeks after the removal of an osteo-sarcomatous tumor from the nose by the late Professor George McClellan, of this city. For the first two weeks after the operation, the patient did remarkably well, and talked of returning to his friends, who lived several hundred miles off. A few days, however, before he had determined to leave, he was suddenly seized with violent rigors, followed in a short time by deep coma, and he expired after an interval of thirty-six hours from the attack. On examination, Dr. Gardner and myself found a large, undefined abscess, filled with thick, offensive matter, on the lower surface of the right anterior lobe of the cerebrum, with partial destruction of the cribriform plate of the ethmoid bone and the intervening membrane in its immediate vicinity.

The brain is occasionally the seat of *metastatic abscesses*, but much less frequently than the lung and liver. They do not, as in these two organs, exhibit, at first, the rounded, circumscribed form, but appear in small isolated points, which are extensively scattered through the cerebral tissue, and rarely, even in the worst cases, exceed the volume of a hempseed, or a small pea. Their number is sometimes immense. They are situated chiefly in the gray substance of the hemispheres and striated bodies: the cerebellum is also occasionally affected, but much more rarely than the cerebrum. The tissues in the immediate vicinity of the purulent collections are generally unaltered.

The disease, as in other parts, is very insidious in its mode of development, and is usually dependent upon injury of some distant organ.

4. *Gangrene.*—Gangrene of the cerebral tissues is a very rare affection, and probably never occurs except as a result of external violence. As an idiopathic disease, I am not aware that a single instance of it is to be found in the writings of pathologists. In this affection, the cerebral substance is at first of a reddish-brown color, but in a very short time becomes spotted with an immense number of minute points, resting upon a lilac, violet, or purple ground. At a more advanced stage, when the mortification may be considered as fully established, the affected part is converted into a soft, pulpy cartilage, of a blackish, brownish, or greenish color, and extremely fetid, a character which distinguishes this lesion from the simple softening presently to be noticed. The cerebral texture immediately around the sphacelated mass generally forms a hard, reddish belt, highly injected, and occasionally even slightly ecchymosed from sanguineous effusions.

5. *Softening.*—Softening of the brain is exceedingly frequent, both as an acute and as a chronic affection. It is by far most common in old subjects, but no age is exempt from it, not even early infancy. The parts of the brain which, according to my own experience, are most liable to it, are such as are most obnoxious to sanguineous effusions, as the fornix, interventricular septum, great commissure, optic couches, and striated bodies; the frequency with which they are affected being in the order here enumerated. In the majority of cases I have found the figurate bodies alone implicated, the convolutions and other structures retaining their normal characters. Both cerebral substances are almost always simultaneously softened, though the white is often affected in a much greater degree than the cineritious.

The extent of the lesion varies in different cases. Occasionally large masses are involved, as one-third, one-half, or nearly the whole of one hemisphere; more generally, however, the lesion occurs in circumscribed spots, varying from several lines to one or two inches, and leaving the rest of the organ of its natural color and consistence. Sometimes the softening occupies a space not larger than a cherry, a pea, or a millet-seed, while in others it is spread over almost the entire surface of both hemispheres and that of the ventricles. A remarkable example of softening of the brain came under my notice in 1836, in a man forty-five years old. In this case, examined twenty-seven hours after death, both the white and gray substance had lost much of their natural firmness and cohesion. The whole of the fornix, excepting its anterior pillars, the interventricular septum, part of the great commissure, and the pineal gland, were completely dissolved. The striated bodies, optic couches, and quadrigeminal tubercles, were likewise much softened; and so tender was the base of the brain that the medulla oblongata, cerebral crura, and roots of the nerves, were all left behind in the attempt to remove the organ from the skull. In the cerebellum, the parts which were more particularly diseased, were the cerebello-testicular processes, the Vieussenian valve, and the gray substance at the under surface of each lobe. The vessels of the pia mater were excessively gorged with blood; and the fibrous texture of the hemispheres, especially of the right, exhibited a considerable number of small, rose-colored patches, dappled with black points, corresponding with the orifices of divided capillaries. No lesion, so far as could be discerned, existed in any other organ.

The appearance and consistence of the part affected vary according to the duration of the disease and the intensity of the exciting cause. In the early stages the changes are always very slight, and can only be recognized by the touch. At a more advanced period, the continuity of the organic particles is sensibly disturbed, and the nervous substance is so soft that it may be readily broken down with the finger into a thin, pap-like mass. It is no longer able to sustain the slightest weight, and frequently has no more consistence than so much cream or thickened milk; it may be easily scraped with the knife, but to cut it smoothly is impossible. Having attained this degree of softening, the cerebral tissue soon falls to pieces, forming thus a breach of continuity occasionally of very considerable extent. If examined with the microscope, the small vessels appear coated with granular matter, and in the softer portions of the mass numerous granules and exudation corpuscles are seen mixed with portions of nerve-tubes. An odor like sulphuretted hydrogen sometimes exhales from the disorganized mass; but this is rare.

Although the softened parts are occasionally separated from the sound by a distinct line of demarcation, yet more commonly they run insensibly into each other. The color varies according to the time that has elapsed since the invasion. In the early stage, when there is usually a considerable degree of inflammatory turgescence, it is often of a uniform rose tint, studded with red dots, or marked with purple arborescent lines; more rarely we find small hemorrhagic effusions, and patches of a dark leaden hue, produced doubtless by intense capillary injection. At a later period of the disorganization, the part is usually of an opaque white, brownish, yellowish, or greenish color; or these tints are blended, different shades of them occurring at different points, or even at the same place. The dull milky hue, which is so frequently observed in this affection, is supposed by Lallemand to be caused by an infiltration of pus, an opinion which is evidently unfounded, as in the vast majority of cases no such fluid whatever is to be seen. In this condition, which is often found after hydrocephalus, the cerebral mass seems to be perfectly anæmic, not a drop of blood oozing from the affected part when cut. In some instances, the color remains natural. When this happens, which, however, is rather rare, the softening is usually confined to the fibrous structure, and may readily escape notice.

In this affection, the pia mater is sometimes seriously implicated. When the softening is seated on the convoluted surface of the cerebrum or cerebellum, or on the surface of the striated bodies and optic couches, the membrane is generally preternaturally red and rough, and, on attempting to raise it, the disorganized gray substance often separates along with it. In other cases, I have found portions of the pia mater completely destroyed, or converted into a dirty brownish pulp, devoid of every feature of the original texture. These changes are particularly liable to happen when the softening affects the surface of the figurate bodies in the floor of the lateral ventricles. In these cases the arachnoid frequently experiences the same fate.

*Chronic softening* of the brain is probably quite as frequent as the acute form of the disease, of which it may be either a consequence, or it may exist as an original and independent affection. It may occur at any period of life, and all parts of the organ appear to be liable to it, though not in an equal degree. It may be limited to the white or cineritious substance, to a single convolution, to the striated body, or to the optic couch. Occasionally it is diffused throughout the different cerebral structures, not uniformly, but in patches of variable extent. The most common seat of the lesion is the hemisphere, including the striated body and optic couch.

The color of the softened part varies according to the nature of the cerebral tissue. In the fibrous substance it is always milk-white, dull-white, opalescent, or of a pale yellow; never red, brownish, or brown-red, as in the acute form of the lesion. There is a total absence of congestion, and in many cases there is hardly even a vestige of capillary vessels. Occasionally, though very rarely, a few long, slender arterial and venous twigs are observed, but the interlacement which they exhibit is very different from the normal capillary plexus. In the cortical substance the color usually partakes more or less of the natural complexion of that tissue, that is, it is either a light gray, or a pale ash. This is particularly the case in the early stages of the disease. At a more advanced period, the affected part gradually loses its grayish color, and assumes a yellowish, or pale dusky aspect. This discoloration may be greater at one point than at another, but in the majority of cases it is pretty uniformly diffused over the seat of the disease.

In the chronic, as in the acute form of the disease, the degree of softening may vary from a slight diminution of the natural cohesion of the cerebral substance to that of a thin solution of starch, or arrow-root, cream, or even milk. In the advanced stage of the disease, when the process is fully established, the affected structure is infiltrated with an unusual quantity of serosity, and reduced to a semi-fluid pulp, which is easily removed by the finger, the handle of a scalpel, or by a small stream of water. These changes, which are generally more conspicuous in the white than in the gray tissue, are frequently followed by the removal of the softened and disorganized matter, leaving in its place a small quantity of cellular substance, of a whitish aspect, traversed by bloodvessels, and exhibiting numerous meshes, filled with a turbid, whey-like fluid. The meshes are of an irregular form, and vary in size from a pin-head to that of a small pea; their walls are extremely delicate, and the fluid by which they are occupied is often mixed with flocculi, which appear to be nothing more than fragments of cerebral pulp. When the patient survives an attack of this kind, the cells thus formed are filled with plastic matter, which becomes speedily organized, and gradually increases in firmness until it finally acquires all the properties of the cellulo-fibrous, fibrous, or fibro-cartilaginous tissue. In no case does there appear to be a reproduction of cerebral matter.

In the gray substance, in the advanced stage of the disease, there is a singular tendency to the production of yellow patches, of a flattened form, finely tuberculated, and extending, when the lesion occupies the superficial portion of the brain, over two or more convolutions. They are remarkably coherent, their surface is traversed by minute vessels, and their consistence may be so great that they are with difficulty torn. In some instances they are surrounded by pulpy matter, and in others, though this is very rare, the cortical substance seems to be destroyed by ulcerative absorption.[1]

The duration of chronic softening of the brain is too uncertain to enable us to affix any precise limits to it. While some cases terminate in three or four weeks, others continue for several months, and even years; the disease in the mean time making very little progress, or even remaining perfectly quiescent.

Softening of the cerebral tissue is usually of inflammatory origin. This is proved, first, by the fact that this lesion occurs at all periods of life, as well as in all parts of the encephalic mass, at one time as an acute, and at another as a chronic affection; secondly, that it is often produced by external injury, and by the pressure of certain tumors, or apoplectic effusions; thirdly, that it is frequently combined with suppuration in other parts of the brain; and, finally, that it occasionally supervenes during the progress of malignant and other fevers. That obstruction of the arteries, and a consequent interruption to the passage of the blood, followed by diminished vital power and cohesion of the part affected, may operate as an exciting cause of the malady in old subjects, is what may be easily supposed; but I am by no means certain that in cases even of this description there is of necessity an absence of all inflammatory irritation. Gangrene under such circumstances is usually, if not invariably, a gradual process, preceded and accompanied by perverted, if not incited, action.

Softening of the brain is often found in connection with ascites, pulmonary phthisis, diabetes, chronic pleuritis, marasmus, and protracted fevers. Grief, anxiety, and intense study, sometimes produce it. This was the appearance which the brain of Sir Walter Scott exhibited. The mollescence involved nearly the whole of the medullary texture of the left hemisphere, which was converted into a soft, flaccid mass, interspersed with numerous globules of water. This mischief was the result, in all probability, of a slow, chronic irritation, produced by the excessive intellectual labor to which this great man subjected himself during the last five or six years of his life, in consequence of his pecuniary embarrassments.

Protracted confinement, with inactivity and low diet, has also a tendency to impair the natural consistence of this organ. A similar state has been witnessed in the cerebral tissues of idiots, lunatics, and epileptics. In an elaborate account of the anatomical changes found in the brains of maniacs and epileptic persons, published, in 1771, by Dr. Greding, fifty-one cases are detailed, in more than one-half of which the organ in question was either partially or generally softened. Observations confirmatory of these have since been recorded by other writers. How softening, under the circumstances here specified, is induced, whether from diminished nutrition of the cerebral textures, or from irritative action, giving rise to an infiltration of serous fluid into its intermolecular spaces, is a point which challenges further researches. Old age, also, seems to predispose to this affection; and the same may be said of arteritis.

---

[1] Durand-Farel, Traité du Ramollissement du Cerveau.

Obstructions and various morbid changes in the cerebral vessels, or in the arteries leading to the brain, are capable of causing the lesion. Thus, ligature of the carotid is sometimes followed by it, and so also is ossification of the cerebral arteries. Similar effects sometimes follow obstruction by plugs of fibrin, washed from other parts of the system into the vessels of the brain. Sometimes the bloodvessels leading to the part, as well as the capillaries in the part, are in a state of fatty degeneration; a circumstance on which considerable stress has been laid by some pathologists, who deny that the white form of softening with which it is associated, is ever of inflammatory origin. Minute examination of the softened tissue shows them to be,at times, filled with exudation corpuscles, especially in the acute or red softening, whilst in the white softening these are absent; in fact, the cells and tubes are here sometimes apparently unchanged. Dr. Todd has, however, frequently detected in the white creamy matter a great number of large cells containing oily substance. These curious organic globules would suggest, he thinks, that some active process had been going on during life.

Softening of the brain is susceptible of reparation, the appearances varying in the gray and white substance. In the gray substance, the traces of the cure, when fully established, are, a peculiar cribriform aspect of the convoluted surface of the brain, either alone, or combined with atrophy and flattening, together with adhesion of the pia mater to the affected part. In the white substance, cicatrization is indicated by numerous little cells, containing a limpid fluid, and lined occasionally by a fine, delicate, transparent membrane, of a light fawn color. These cells have sometimes a worm-eaten appearance, and not unfrequently they seem as if they had been scooped out with a sharp instrument. In their figure, they strongly resemble the pores observable in new bread, their size varying from a pin-head to that of a bean. The cerebral tissue in the immediate neighborhood of these cicatrices is either of the natural consistence, slightly softened, or, as is more frequently the case, considerably indurated, according to the period that has elapsed since the commencement of the healing process. Occasionally the white matter has a peculiar granular aspect.

6. *Chronic Inflammation.*—Chronic inflammation of the cerebral tissue is much more common than acute, of which, indeed, it is not unfrequently a result. Its anatomical characters, though occasionally similar, are yet, in the great majority of cases, widely different; and it is therefore necessary that they should be considered under a distinct head.

The most important feature of this disease is the augmentation of density of the affected tissue, giving rise to *induration* of the cerebral tissue. Not a little diversity is observable in regard to the degree of hardening.

In the generality of cases, the consistence does not exceed that of concrete albumen; not unfrequently, however, the part is as firm as cheese; and instances occur, although very rarely, in which it is as dense and elastic as fibro-cartilage. The latter species of induration is generally seen in small, isolated masses around old apoplectic cysts, tubercles, and fungous growths. The other two, which often occupy a considerable extent of surface, sometimes coexist, running insensibly into each other. General induration has hitherto been seen chiefly in individuals that have died of typhus fever; and Andral tells us that he also witnessed it several times in persons who had been in the habit of working among lead, and who expired in a state of universal convulsion.

The proximate cause of cerebral induration is a deposition of lymph into the connecting cellular tissue, by which the intermolecular intervals are filled up, and the fibres of the brain firmly cemented together. That this is the case, is not only analogically inferrible, but may be readily proved by examination with the microscope. A portion of brain thus affected possesses little or no moisture, recoils with elasticity when stretched, and tears with a rough and slightly granulated surface. The natural vascularity is usually very much diminished, probably from an obliteration of some of the capillary vessels; and hence the ordinary color is yellowish white, milky, or grayish; seldom reddish, brown, or claret, as we find it to be in acute softening of the cerebral tissue.

Chronic cerebritis, after having existed for some time, may suddenly assume an acute character, and thence pass into suppuration. A shade of green usually announces this event; and, as the process advances, the part gradually acquires a yellow tinge, and a soft, pulpy consistence. The pus is rarely confined in a distinct cavity; on the contrary, it is usually diffused through the softened mass, oozing out of it, when a section is made, in the form of small globules.

7. *Ulceration.*—Ulceration of the brain is very uncommon, and has hitherto been found chiefly on the striated bodies, the optic couches, and the convoluted surface of the cerebrum, in the latter of which it is by far most frequent.

The ulcers, which seldom penetrate beyond the gray substance, and which affect various forms, have generally rough, indented edges, with an irregular surface, covered, for the most part, with reddened lymph, in some cases with pus, and occasionally even with blood. Instances occur in which they are hard and dry; and sometimes, though rarely, they communicate together by fistulous tracks, in the same manner as ulcers occasionally do in other parts of the body. In their dimensions they vary from a few lines to several inches, the largest being almost always seated on the external surface of the brain.

The cerebral tissue immediately contiguous to these ulcers usually exhibits signs of inflammation, being of an unnaturally red color, and of varying degrees of consistence. The pia mater and arachnoid ar also more or less affected; a circumstance from which some pathologists have been led to infer that these ulcers rather appertain to them than to the cerebral substance. This, perhaps, with a few exceptions is true. Occasionally, the ulcer communicates with deep-seated abscesses.

8. *Apoplexy.*—Apoplexy exhibits remarkable variety as to its sea and extent. In many cases the blood is poured into the substance o the brain; in some, upon the external surface; and in some, again into the ventricles. Of these three forms, the last is by far the leas frequent; next to this is the meningeal, or that in which the fluid is extravasated upon the surface of the brain; and the most common of all is where it is diffused through the cerebral tissue. It has also been found that certain parts of the encephalic mass are more liable to hemorrhage than others. Thus of 392 cases of this disease, collected by Andral from the writings of different pathologists, 202 affected the interior of the cerebral hemispheres on a level with the floor of the lateral ventricles; in 61, it was seated in the striated bodies and in 35, in the optic couches. The cerebellum and cerebrum are rarely affected.

In regard to the extent of these extravasations the greatest possible variety obtains. The quantity is often very trifling, not exceeding a few drops, or the volume of an ordinary pea; sometimes, however, the effusion is quite copious. In one instance, that of a female fifty-six years of age, I found it amounting to nearly eight ounces The number of extravasations is also liable to much variation. Very frequently there is only a solitary one, whilst at other times there are as many as ten or a dozen. When numerous, the hemorrhagic depôts usually exhibit different appearances, as if they had occurred at different periods.

The extravasated blood varies in its character according to the length of time that has elapsed between the attack and the death of the patient. When the apoplexy proves suddenly fatal, the fluid is dark colored, almost fluid, or in soft, semi-liquid masses. If the individual survive some time, the clot acquires a greater degree of consistence, and is of a pale red, grayish, or yellowish tint. At a still more advanced stage it becomes hard, dense, and fibrinous, and is either organized, partially or entirely absorbed, or converted into a loose, drab colored cellular substance, presenting, when cut, a peculiar appearance, not unlike that of a honeycomb. These changes usually begin within the first fortnight after the attack, and are completed at the expiration of several months, the length of time being always greater in proportion to the size of the clot. The peculiar crystals of the blood are described by Virchow as seen in apoplectic clots, but are not generally observed before the third week.

The substance of the brain around the extravasated blood often presents important lesions, consisting chiefly in a change of color and consistence. Very frequently, it is softened, lacerated, and infiltrated with serosity, with blood, or even with puriform matter, or perhaps all these fluids are found in intimate combination. The color, in such cases, is either natural, reddish, yellowish, or greenish, according to the degree of capillary injection, or the amount of inflammatory irritation. In some instances, we find the apoplectic cavity intersected with shreds of cerebral substance, so incorporated with the extravasated fluid as to be hardly distinguishable from it. In chronic cases, the surrounding parts are more commonly indurated and brittle; but this occurrence is by no means constant.

The effused blood is often surrounded by a distinct cyst, formed by plastic matter, from the fourth of a line to the eighth of an inch in thickness. At first, the sac is quite soft; but it gradually increases in consistence, and is finally completely organized, its parietes being abundantly supplied with vessels, which not unfrequently extend even into the inclosed clot itself. Its external surface is generally flocculent, and the cerebral tissue immediately around it is variously altered, being either softened, infiltrated with pus, or indurated. In time, the sac becomes both an absorbing and a secreting texture, as is evinced by the fact that its interior is often filled with substances quite different from those that were deposited in the first instance; and also by the circumstance that it is sometimes completely cicatrized, its walls being brought so closely together as to leave merely a hard fibrous band.

The number of apoplectic cysts usually corresponds with the number of sanguineous effusions, and hence several are occasionally seen in different parts of the same brain. In examining, not long ago, an old man who died of softening of the brain, produced by the irritation of a large clot of blood, I found as many as a dozen of such sacs scattered through various portions of the cerebral hemispheres, the largest of which hardly equalled a hazel-nut: they were of a yellowish color, of the consistence of cellular tissue, and marked off each into several little cavities, filled with thin, turbid serosity.

The preceding facts are interesting, as showing how much may be effected by the restorative powers of the system. No sooner has the effusion taken place, than nature sets up a process of reparation, in which she is often so successful that in the course of a short time the clot is either absorbed, encysted, or so altered in its physical and vital properties as to be no longer viewed by the organ in the light of a foreign body. There are several circumstances which favor the absorption of the coagulum, but none so powerfully as a healthy condition of the cerebral circulation; a fact of great practical moment, as it inculcates the importance of paying attention to the head, long after the apoplectic seizure has taken place.

Apoplexy has been observed at all periods of life, in infancy, childhood, adolescence, old age, and decrepitude. Experience, however, has demonstrated that the most obnoxious time is after the fiftieth year. The disease is more common in men than in women, probably because the former are more addicted to all kinds of excesses, both bodily and mental, than the latter. Occasionally it appears to be hereditary.

One of the most frequent lesions in cases of apoplexy is disease of the bloodvessels. It is only of late years that the state of the bloodvessels surrounding apoplectic effusions has been studied, and much yet remains to be done in this respect. Sufficient facts have, however, been gathered to prove that in many cases of apoplexy the capillaries, as well as the larger vessels, are affected. The changes that seem to occur most frequently in them, are atrophy and fatty deposits, rendering their walls unable to withstand the pressure of the circulating blood. In many cases the diseased and lacerable condition of the cerebral vessels is accompanied by softening of the nervous pulp, which thus powerfully predisposes to hemorrhagic effusion.

Accidental accumulations of blood occasionally exist upon the surface of the brain from the rupture of an aneurismal sac, a blow upon the skull, or the pressure upon the child's head during parturition; but these are not, strictly speaking, apoplectic in their character.

9. *Hypertrophy and Atrophy.*—The brain is sometimes hypertrophied. In this state the convolutions of the organ are singularly compressed and flattened, and the intervals between them are almost obliterated, the investing membranes being at the same time partially stretched, and appearing as if they were too tight for the inclosed mass. The ventricles are very nearly effaced, and the various surfaces of the organ are deprived of their ordinary moisture. The cerebral substance is unusually firm, almost destitute of blood, and remarkably dry when cut. The hypertrophy commonly involves both hemispheres; occasionally, however, it is confined to particular parts; and in some instances, again, the increased growth is so great as to produce an evident enlargement of the skull. It is rare in the cerebellum. Children and very young persons, particularly such as are subject to frequent attacks of epilepsy, are most liable to it; but even in them it is extremely rare.

*Atrophy*, the opposite of the above state, is sometimes witnessed. In idiots, in cases of hydrocephalus, and in aged persons, the brain occasionally undergoes a remarkable diminution in all its parts, both gray and white; and the same circumstance is not unfrequently observed in young people who have suffered from long-continued wasting disorders. The marks by which atrophy may be recognized are, a flaccid and shrunken state of the convolutions, interstitial cellular infiltration, peculiar stringiness of the cerebral pulp, and dilatation of the bloodvessels, whether empty or filled. Conjoined usually with these appearances are thickening of the cranial bones, and distension of the ventricles.

Like hypertrophy, the affection in question may be general or partial. The latter variety is most commonly seen in the striated bodies and optic couches. In place of the natural rotundity, the surface of these structures is remarkably flattened, contracted in its dimensions, or even scooped out, as it were; and, on cutting into them, their substance appears loose and cellulated. Very frequently instances of partial atrophy are witnessed on the convolutions, which are either smaller and less numerous than usual, or almost wholly absent. In such cases there is often very little gray matter. Atrophy of the cerebellum is by no means uncommon, and sometimes amounts to almost entire absence of this portion of the encephalic mass.

10. *Tubercles.*—Tubercles of the brain are found chiefly in childhood, seldom in very young infants, and still more rarely in adults. The disease is always associated with a scrofulous habit of the constitution, and hence occurs most frequently in conjunction with tubercles of the other organs, especially of the lung, spleen, and mesenteric ganglions.

The localities of the brain in which tubercles are most commonly found are, the cerebral hemispheres, cerebellum, great commissure, medulla oblongata, cerebral and cerebellic crura, the optic couches, and striated bodies, the frequency of their occurrence being in the order here enumerated. They may occupy, indifferently, the cortical or fibrous substance; and occur either in groups, or, as is more commonly the case, in disseminated masses.

Although the number of these bodies seldom exceeds half a dozen, yet cases occasionally occur in which there are as many as twenty, fifty, seventy-five, or a hundred. In size, they vary from that of a millet seed to that of a walnut, their magnitude being generally in an inverse ratio to their number. Not unfrequently they are so large as to occupy the greater part of one of the lobes of the cerebellum, or of one of the hemispheres of the cerebrum. In form, they closely resemble tubercles in other organs and textures. In some instances, especially when they are clustered together, they are uneven, nodulated, and separated into lobes, connected by dense cellular tissue. Their color is a pale yellow, white or bluish, and their consistence is like that of soft cheese, though occasionally much firmer.

Apparently destitute of vessels, these bodies exhibit no trace whatever of being organized; yet that they are so, cannot be well doubted. In the generality of cases, if not in all, they are surrounded by a distinct cyst, often remarkably thin, but which now and then is of great thickness, and of a fibrous, cartilaginous, and even bony texture. After these tubercles have existed for some time, they assume an opaque, dusky appearance, and are finally converted into a soft, cheesy matter, precisely analogous to that of tubercles in other situations. Numerous abscesses are thus occasionally formed, which may be readily discriminated from such as are of a simple inflammatory origin, by the nature of their contents.

The cerebral tissue around these tubercles is variously affected. During the early periods of their formation it may be quite natural; but, as they proceed in their development, inflammation is often excited, which generally leads to induration, softening, or purulent infiltration.

11. *Melanosis.*—Melanosis of the brain is among the rarest productions to which this organ is liable. Though it occasionally occurs in small dots and narrow streaks, the most common form in which it appears is that of spherical masses, of a jet black, brownish, or livid color, varying in size from a mustard-seed to that of a hen's egg. They are distinctly circumscribed, but apparently without any cyst, and closely surrounded by healthy brain, from which they can be easily lifted with the forceps. Vessels may frequently be traced into their interior; and, when they are seated on the convoluted or figurate sur-

face of the organ, it is not unusual to find them intimately adhering to the pia mater. Their softness is often remarkable, the black coloring matter which they contain being nearly as fluid as ink.

If these tumors be divided with a sharp knife, and washed with water, the coloring matter disappears, and nothing but a soft, shaggy substance, of a cellulo-fibrous nature, remains. This, no doubt, is the nidus in which the melanotic matter is originally deposited.

12. *Encephaloid.*—Encephaloid is occasionally met with in the brain, chiefly in young subjects, before the age of twenty, in the form of soft, spongy, compressible tumors, enveloped by a distinct cyst. The surface of these tumors is frequently lobulated, and their interior closely resembles the gray substance of the brain, with a tinge of red. When cut with a knife, the section is smooth, and the instrument is covered with a soft, unctuous, cream-like matter. The capsule itself, varying in thickness from one to several lines, is often of a deep reddish color, liberally furnished with vessels, externally flocculent, and closely adherent to the surrounding parts. Solid masses of extravasated blood are occasionally intermixed with these tumors; in many cases the cerebral tissue immediately around them is in a state of softening.

13. *Cartilaginous and Calcareous Deposits.*—Masses of cartilage have been found in the brain; but they are uncommon. They may attain a very considerable volume, and they are generally of an irregularly rounded shape, with a rough, lobulated surface; of a dense, gristly consistence; and of an opaque, bluish color; internally they present a radiating, fibrous arrangement, not unlike an unripe pear. When old, they not unfrequently contain small cavities, filled with curdy, gelatinous, or sanguinolent matter. They are seldom, if ever, enveloped by a distinct cyst.

*Calcareous deposits* are also very unfrequent. They occur chiefly in old consumptive subjects, in the form of scattered granules, about the size and shape of saw-dust; sometimes, however, they are seen in irregular nodules, varying in volume from a small pea to that of a large plum. Composed chiefly of phosphate of lime, in combination with a minute proportion of animal substance, these concretions are commonly of the consistence of dry mortar, and readily yield to the pressure of the finger. Cases occur in which they consist of alternate layers of chalky matter and solid albumen; whilst some, although gritty to the touch, contain no chalky matter at all, but present the reaction of starchy granules, being ordinarily somewhat reddish, with a rough, lobulated, or spicular surface; and they are generally surrounded by a delicate vascular membrane, which connects them to the contiguous cerebral substance.

Earthy concretions are very common in the pineal gland. In this situation, they are almost always agglomerated into an irregular-shaped mass, varying in magnitude from a pin-head to an apple-seed, the largest being usually in the centre. They are of a yellow citron color, hard, rough, and gritty, and, what is remarkable, are never found until about the age of seven or eight years. After this period, there are few individuals in whose brains they do not occur. Their presence does not seem to occasion any particular inconvenience.

14. *Cysts and Hydatids.*—Small cysts, containing a transparent yellowish fluid, of the character and consistence of serum, are sometimes met with in different parts of the brain, especially at its base, on the floor of the lateral ventricles, and on the convoluted surface of the hemispheres. Of this variety of morbid growth I saw, not long ago, an interesting case, in a hydrocephalic child ten months of age. The tumor, situated at the posterior and inner part of the right ventricle, which was itself enormously enlarged, was about the size and shape of a hen's egg, with perfectly smooth, polished, and transparent coats, not thicker than the healthy omentum. The fluid which it contained was thin and colorless, like the clearest spring-water. But such is not always the appearance of these cysts. Often they are quite opaque, speckled with grayish dots, and of a dense, fibrous texture. Their contents, in such cases, are of a milky-white, gelatinous, and readily coagulable by heat, which is not the case when their structure is very delicate. Several such tumors are occasionally found in the same brain, either in different parts or in close proximity with each other.

The *acephalocyst*, or headless hydatid, is rarely seen in the brain. This animal is inclosed in a distinct membranous sac, and seldom acquires any great size.

15. *Tumors.*—The *adipose tumor* is rarely found in the brain. It varies in size from a small hickory-nut to a hen's egg, is rough and lobulated on the surface, of the color of fat or adipocire, of the consistence of spermaceti, tallow, or soft wax, and enveloped by a fine, delicate, vascular cyst. It is composed of very minute and closely aggregated lobules. Occasionally it is made up of concentric layers, united by dense cellular tissue: Otto saw a tumor of this kind which contained hair. Chemical analysis has shown that this growth consists principally of fatty matter, with a minute amount of cholesterine. This latter ingredient is so much the more remarkable, inasmuch as the human brain always contains a small quantity of it in the normal state.

The *fibroid* tumor has been but seldom noticed by pathologists. Most generally of the size of a small nut, and of an oblong shape, it is of a pale flesh color, hard, firm, but somewhat spongy in its texture, and enveloped by a distinct cyst, having apparently very little connection with the cerebral substance. It may occur in any part of the brain, and in some instances exists in considerable numbers.

The origin of fibroid tumors is still involved in obscurity. Taking into consideration, however, their peculiar texture, and flesh-colored aspect, it appears not improbable that, in the generality of cases at least, they are the result of apoplectic effusions, the blood being merely deprived of some of its red particles, and the remainder modified in such a way as to assume the characters which appertain to this kind of deposit. The supposition certainly derives support from the fact that the subjects of these tumors are, for the most part, persons who have labored, at one time or other, under symptoms of palsy, apoplexy, epilepsy, or mental derangement.

## SECTION II.

### ENVELOPS OF THE BRAIN.

I. *Dura Mater.*—The dura mater is susceptible of *inflammation.* The disease, which generally occurs in irregular circumscribed patches of greater or less size, rarely exists, except as a consequence of external injury. When thus affected the membrane presents numerous fine vessels, filled with florid blood, and scattered about in beautiful arborescent lines. The discoloration is often of a peculiar bluish tint, not unlike what we see in sclerotitis; and, although the injection is sometimes remarkably great, yet the inflamed portion is never so much crowded with vessels as some other membranes, which are naturally more vascular. In most cases, the inner surface of the dura mater is covered with small masses of lymph, and it may even be lined by a tolerably thick, adventitious membrane. In this manner, extensive adhesions may be formed between it and the other tunics, or even between it and the convoluted surface of the brain.

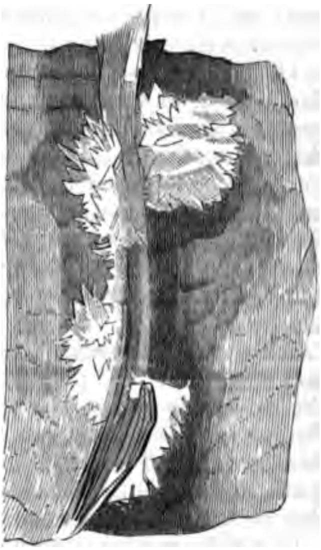
*Suppuration* of the dura mater is seldom met with, except as a consequence of external violence. The matter is commonly deposited upon the inner surface; but instances are witnessed in which it is situated externally. In the latter case, when the fluid is considerable, long retained, or of an acrid quality, it may destroy the membrane and escape into the arachnoid sac. Occasionally, too, it produces caries, and perforation of the cranial bones; but such occurrences are unfrequent.

The changes which result from *chronic inflammation* of the dura mater are various. The most important, however, are thickening, fibrous growths, and ossification. The thickening, which is almost always conjoined with induration, may be so great as to occasion symptoms of cerebral pressure. It is sometimes found in fatal cases of epilepsy and paralysis. In one instance which fell under my notice, the thickening was connected with caries of the frontal bone, the membrane presenting a very rough, fungous appearance. The reverse of this state is sometimes observed, the dura mater being remarkably thin and attenuated.

*Fibrous tumors,* of the size of a small nut, sometimes grow from the dura mater, generally from its inner surface, to which they adhere either by a narrow footstalk, or by a broad base. They are of a grayish color, of a dense, fibrous texture, hard, inelastic, and seldom acquire any great bulk.

One of the most common morbid appearances of the dura mater, is a deposit of *osseus* matter. It usually occurs in the form of thin plates, and probably always takes its rise in the subserous cellular tissue, and not in the substance of the membrane itself. It is most generally noticed in the great falciform process, where it occurs in small, irregular masses, not larger than a finger nail. In several instances, however, I have seen it of the size of a Spanish dollar; and cases occur in which it occupies nearly the whole of the dura mater of one hemisphere. These bony substances are generally very hard, of a whitish aspect, more or less rough on the surface, and, when sawed, they occasionally exhibit a real porous structure, like the natural osseous tissue. Fig. 111 represents several plates of this kind on each side of the longitudinal sinus. The drawing is from a preparation in my private collection.

Fig. 111.



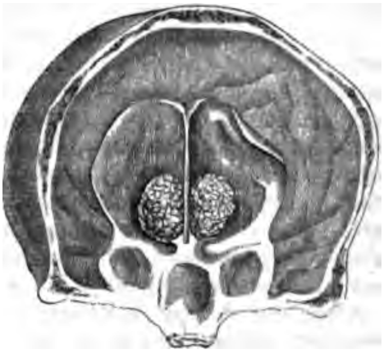
Osseous deposits upon the dura mater. From a preparation in my cabinet.

Bony growths attached to, and pressing on, the dura mater, are frequently observed in women who die during, or shortly after, pregnancy. They do not spring from the dura mater but appear merely to be connected with it. Rokitansky, who first observed them, terms them puerperal osteophytes, and regards them as of regular occurrence during pregnancy.

Various other kinds of morbid growths and deposits are found in the dura mater; but their occurrence is so extremely rare, and their nature so little understood, as to render it useless to give any account of them in this place.

I am not aware that *carcinoma* has ever been observed in the dura mater as a primary affection. As a secondary effect, however, cases are sometimes met with, although they are rare. The adjoining sketch (Fig. 112) was copied from a specimen sent me, some years ago, by Professor Buchanan, of Nashville, of epithelial cancer of the face, which, as it extended its ravages, caused the most frightful gap in the head, consuming the eyes, nose, and frontal bone, and finally reaching the brain. The patient was an elderly man, who had been several times subjected to operation, without any material benefit. A tumor of a globular shape, tolerably firm, and tuberculated on the surface, is seen on each side of the falx, intimately connected with the dura mater, from which it evidently took its rise, as it was entirely unconnected with the main disease.

Fig. 112.



Carcinoma of the dura mater. From a preparation in my cabinet.

The *Pacchionian glands* are occasionally much enlarged, indurated, and changed in their appearance. The *sinuses* of the dura mater are also sometimes diseased. The most frequent affection is inflammation of their lining membrane. In this condition the serous tunic is unnaturally vascular, opaque, and incrusted with lymph. The sinuses are sometimes partially filled with pus; and it is not uncommon to find them obstructed with firm, dense, fibrinous concretions.

II. *Arachnoid.*—The arachnoid is liable to acute and chronic inflammation, and to various morbid deposits. The most important anatomical characters of *acute arachnitis* are increase of color, opacity, thickening, and preternatural firmness, with effusion of serum, lymph, pus, and sometimes blood. In the early stage of the disease, the membrane does not present any perceptible alteration, but remains thin and transparent as in the normal state; and, what is remarkable, the pia mater is almost always affected first, being usually thickened and deeply injected, long before any change can be recognized in the arachnoid itself.

All parts of the arachnoid do not seem to be equally susceptible of inflammation. The portions most frequently implicated are those in the ventricles of the brain, on the convexity of the hemispheres, at the base of the cerebellum, the junction of the optic nerves, the Varolian bridge, and lastly, at the internal flat surface of the hemispheres. Such, at least, is the result of my own observations, corroborated by that of some of the most distinguished pathologists of the age.

The redness of the arachnoid is usually limited in its extent, being restricted to a few points on the convexity of one or both hemispheres, at the base of the brain, or between the lobes of the cerebellum. Occasionally, when the inflammation is very intense, the redness occurs in pretty large patches, and appears to be caused by a real extravasation of blood; but, even under these circumstances, it is quite impossible to trace any vessels into the affected membrane; they belong, in fact, rather to the pia mater and the connecting cellular tissue than to the arachnoid itself. What strengthens this opinion is, that the color may frequently be removed by scraping the part with the scalpel, or exposing it for a few minutes to a gentle current of water; which would be impracticable if it existed in the substance of the membrane.

With this augmented vascularity, if so it may be styled, is usually conjoined, at an early period of the disease, a loss of the natural transparency. At first there is merely a slight degree of opacity, scarcely appreciable without the closest examination; but, by degrees, the membrane assumes a whitish, milky aspect, interspersed, not unfrequently, with shining pearly specks, and small patches of red. Cases occur in which the arachnoid exhibits a dark mottled appearance; but this is rare. The vessels, as an examination by the microscope proves, contain many granules and inflammatory corpuscles; and similar bodies may also be observed lying loose in the surrounding structures.

After the disease has existed for some time, especially if it have been very violent, the membrane is found to have a real increase both of thickness and of density, so that it may be easily detached from the surface of the brain, and even from the dura mater. These changes although they sometimes occupy a considerable extent of surface, usually occur in small patches, which are confined to some parts of the upper surface of the hemispheres, the cerebellum, or base of the cerebrum. In cases of this kind, the pia mater is not only deeply injected, but the cellular tissue between it and the arachnoid is infiltrated with various kinds of fluids, as serum, lymph, blood, and occasionally even pus. These substances may all be witnessed at the same time; but, in the generality of instances, the first two alone are met with. Occasionally, the subarachnoid tissue is emphysematous.

The effusion of serum is sometimes very copious; and, in parts where the subarachnoid cellular tissue is very loose and abundant, as, for example, in the intergyral spaces, at the fissure of Sylvius, the Varolian bridge, and the junction of the optic nerves, the distension may be so great as to raise the membrane in the form of considerable vesicles, of a gelatinous appearance. In quantity, it may vary from a few drachms to several ounces, being always more copious in the ventricles than on the surface or base of the brain. In its appearance, it is usually limpid, but now and then opaque and milky, from the admixture of lymph. When the inflammation is very severe, we sometimes meet with deposits of pure blood, either in the subarachnoid cellular tissue, in the substance of the pia mater, or in the intergyral spaces. The presence of puriform fluid is always indicative of high vascular excitement, and frequently attends wounds, contusions, and other lesions of the head. Dryness of the arachnoid is occasionally observed, generally in small patches, of a hard, shrivelled aspect. Their presence always denotes excessive cerebral irritation.

The deposition of lymph is much less frequent upon the arachnoid than upon the pleura or peritoneum; yet that it is very often met with here, is certain. Nor is it always confined to the free surface of the membrane. In the majority of cases, indeed, it occurs in the subjacent cellular tissue, in the form of a yellowish or greenish infiltration. In some instances, again, it follows the course of the pia mater, producing adhesion between the convolutions, and filling up their intervals: occasionally, though rarely, it is witnessed in the ventricles, over the choroid plexus; and a very common seat of it is the superior surface of the tentorium. In its color, this deposit is generally more or less opaline, with various shades of green and yellow.

When occurring upon the free surface of the arachnoid, the lymph is often moulded into a distinct membrane, the thickness, color, and consistence of which are materially influenced by the length of time it may have existed, as well as by the violence and extent of the attendant inflammation. In a stout athletic man, thirty-five years of age, who died of acute meningitis, brought on by a most extensive fracture of the skull, the exudation, which covered the greater part of the right hemisphere, was about the thickness of a common wafer, of a pale straw color, inclining to greenish, and of the consistence of the buffy coat of the blood, before it has undergone perfect coagulation. The rapidity with which this deposition may take place was well exemplified in this case, in which the patient expired in less than three days from the occurrence of the accident. In instances of long standing, the color is usually lighter, the consistence more firm, and the thickness greater: occasionally the adventitious membrane is vascularized.

In children, acute meningitis is generally dependent upon the presence of *tubercles* in the subarachnoid cellular tissue. They are commonly most numerous along the course of the large vessels on the hemispheres and at the base of the brain, particularly in the fissure of Sylvius. In their size they vary from that of a grain of sand to that of a millet-seed, which they seldom reach, and never exceed. They are rounded or flattened, of a whitish, opaline, or grayish tint, semitransparent, and generally isolated, or disseminated, but sometimes grouped. Their consistence ranges from semi-concrete lymph to fibrocartilage. The older granulations are commonly opaque, hard, of a pale yellowish color, and firmly adherent to the parts in which they are developed.

The arachnoid in this disease is ordinarily free from adhesions, smooth, and more or less transparent. Its surface may be dry or moist, and in many cases it is covered with a viscid, glutinous, or sticky secretion. The pia mater, the principal focus of the disease, is preternaturally red, engorged with blood, and infiltrated with serosity. When the latter exists in considerable quantity, it is often of a greenish tint, and of a thick, jelly-like consistence. The vessels, both large and small, on the surface of the brain, are generally excessively distended, especially when the tubercles are numerous, and the disease has been unusually tardy.

Along with these changes there may be deposits of lymph on the free surface of the arachnoid, more or less flattening of the convolutions of the brain, softening of the figurate bodies, and effusion of serosity in the ventricles. The degree of softening varies in different cases, and is always most conspicuous in the fornix and inter-ventricular septum, which are occasionally converted into a white, pulpy, diffluent substance, of the consistence of thick cream, thin starch, or custard. In some rare cases the softening extends to the striated bodies and optic couches. The serum in the ventricles varies from a few drachms to several ounces; it is commonly clear and limpid, but now and then it is turbid, or white and milky, especially when there has been inflammation of the choroid plexus. The occurrence of purulent matter in this form of the disease is rare.

Tubercles of the subarachnoid cellular tissue usually coexist with similar deposits in the lungs and lymphatic ganglions. This is particularly true of infants; in adults the coincidence is less frequent. The disease may occur at any period of life, but is most common from six to ten years, then from three to five, next from eleven to thirteen, and finally from one to two. Like tubercular formations in other parts of the body, it is occasionally hereditary. Death may occur from a few days to several weeks. The disease sometimes pursues a strictly chronic course.

Such are the principal anatomical features of the two forms of acute arachnitis. In the chronic variety the alterations are still more diversified, consisting of more or less thickening and opacity of the arachnoid and pia mater, increase of firmness and tenacity, organized adventitious membranes, tubercles, cartilaginous and osseous concretions, and, in some cases, of copious effusions of serum, giving rise to what is named *hydrocephalus.* In acute arachnitis, as has been stated, the quantity of serum seldom exceeds two or three ounces; in chronic, on the contrary, it is always very considerable. I have myself seen more than two quarts of fluid; and cases are narrated in which it amounted to upwards of two gallons. Chronic hydrocephalus not unfrequently exists as an intra-uterine affection; more commonly, however, it makes its appearance soon after birth, and proceeds until the head attains an enormous development, out of all proportion to the rest of the body.

The fluid of hydrocephalus is generally perfectly clear and limpid, possessing, indeed, very much the same qualities as the serum of the blood, from which it is derived. In most cases, it is without smell and taste, although the latter is sometimes slightly saline. By exposure to heat, it is occasionally as perfectly coagulable as the water of ascites, hydrothorax, or hydrocele; but in general the quantity of albumen is much less than in those diseases; and hence heat, alcohol, and acids seldom exert upon it the same marked effect.

The specific gravity of this fluid is a little greater than that of water, in the proportion of about a twentieth part. The best analysis is that by Dr. Marcet, who found the solid contents of one thousand grains of the fluid of the ventricles to consist of—

| | |
|---|---|
| Water | 990.80 |
| Muco-extractive matter, with a vestige of albumen | 1.12 |
| Muriate of soda | 6.64 |
| Subcarbonate of soda, with a vestige of an alkaline sulphate | 1.24 |
| Phosphate of lime, with traces of phosphate of magnesia and iron | 20 |
| | 1000.00 |

Chronic hydrocephalus is usually connected with softening of the cerebral tissue, which is not unfrequently quite pulpy and reticular. The parts most commonly affected are the great commissure, fornix, and inter-ventricular septum. In young children, who are mostly the subjects of this accumulation, the bones of the skull are often widely separated, the brain is unfolded, and the whole head is remarkably distorted. In a case which I recently examined, a considerable number of minute apoplectic effusions were discovered, particularly in the right cerebral limb, just in front of the Varolian bridge, where there were as many as a dozen.

The ventricles of the brain are variously affected. When the quantity of fluid is considerable, they are expanded into large sacs, frequently lined by a thin layer of lymph, into which vessels may be seen dipping from the subjacent parts. In such cases, the figurate bodies of the brain are sometimes wholly destroyed, the convolutions effaced, and the gray substance compressed into a thin shell, occasionally not more than half a line in thickness.

The arachnoid, like other serous sacs, is liable to *hemorrhage.* The occurrence is chiefly met with in children under two years of age, in whom, in fact, it constitutes by far the most frequent form of cerebral hemorrhage. The most common site of the effusion is the convex surface of the brain: it may also occur on the plane surface of the cerebrum, but never on that alone. It is usually present on both hemispheres, but does not appear to be more frequent on one side than on the other. The blood is seldom found in an unaltered state; on the contrary, it speedily separates into serum and crassamentum, the latter of which, in a short time, assumes the form of a clot or layer, of a black, dark red, brownish, or pale yellowish color, thicker at the centre than at the circumference, irregular in its shape, lacerable, and from a few lines to several inches in diameter. One surface is commonly free, while the other almost always adheres to the parietal layer of the arachnoid, from which, however, it is easily detached, leaving the part with which it was in contact smooth, polished, and unaltered. The number of clots is variable; sometimes there is only one, while at other times there are several. In either case, they usually coexist with a thin, yellow, or transparent membrane, with the edges of which they are insensibly blended. Whether this membrane, which is sometimes opaque, firm, and pearly, like the dura mater, is produced by a deposit of plastic lymph, or whether it is caused simply by the transformation of the effused blood, is not determined. Their continuity would seem to point out a common origin. In the adult the membrane has been observed, in a few rare instances, to have a distinctly stratified structure, indicating that there were several successive deposits of blood.

When this adventitious membrane adheres, as it sometimes does, to both surfaces of the arachnoid, it may be converted into a kind of cyst, which usually contains from a few drachms to several ounces of clear, limpid fluid. When the quantity is more considerable, the fluid will necessarily, on the one hand, compress the brain, and, on the other, distend the yielding walls of the cranium, producing thus a translucent, fluctuating tumor, either diffused or circumscribed, very similar to that of ordinary chronic hydrocephalus. In this way the disease may ultimately prove fatal, or the accumulated water may be absorbed and the cavity of the sac be obliterated.

III. *Pia Mater.*—The pia mater, considered separately, is not, on the whole, very often diseased. In arachnitis, it is not unusual, as was before stated, to see its substance inflamed, and its vascularity greatly augmented, with small masses of lymph adhering to its surfaces, especially the outer. Under these circumstances the vessels of the pia mater, unnaturally conspicuous, and filled with florid blood, form, by their anastomoses, a beautiful network. Most generally, this augmented vascularity occurs in considerable patches, which are often of a bright red color, and easily detached from the convolutions of the brain. Small sanguineous effusions are occasionally observed; and, in some instances, the part presents an ecchymosed aspect. When the pia mater is inflamed in a high degree, pus is commonly formed, which may diffuse itself over the whole upper surface of the brain, or finally destroy the membrane, and thus come in contact with the cerebral tissue. Ulceration and mortification, however, are rare consequences of inflammation of the pia mater.

*Ossification* of the pia mater is very uncommon, and the same is true of fungous, bloody, and encysted tumors. An instance is mentioned where an encysted tumor of the pia mater contained fat.

Diseased appearances are sometimes noticed in the *lateral ventricles*, especially in the choroid plexus. As a consequence of inflammation, the lining membranes are sometimes very much thickened and indurated, their vessels gorged with blood, and their free surface covered with patches of lymph, of variable thickness and density. In the choroid plexus, the most common appearances are *serous cysts*, formed by a very delicate, vascular, and transparent membrane, and filled with a clear, limpid fluid. I have never seen them very large, though occasionally they attain a considerable bulk. Their number is often very great. In an old man of seventy-five I found a dozen clustered upon the right choroid plexus, the largest of which hardly equalled a common cherry. Instances are recorded in which as many as a hundred were seen in the same individual.

The ventricles of the brain seldom contain *hydatids;* and there is reason to believe that the serous cysts, just described, are frequently mistaken for them. The two varieties which have hitherto been observed are the headless and bladder-tailed; of the latter of which five species have been seen by different pathologists.

The vessels of the choroid plexus are sometimes greatly enlarged, tortuous. and almost varicose. Upon the choroid plexus, as well as on the lining of the ventricles, abundant *granules* are frequently met with. Many are ordinary calcareous corpuscles; but others, if treated with iodine and subsequently with sulphuric acid, display the violet color characteristic of vegetable cellulose. This interesting observation, first made by Virchow, has been abundantly confirmed by other observers. These cellular corpuscles are, however, by no means restricted to the ventricles. They have been found on the surface of the brain, optic nerve, or the retina, and also, as will be hereafter described, in several of the viscera. What their exact pathological import is we have as yet no means of judging. Possibly they may be physiological structures.

In making examinations of the brain we occasionally meet with bubbles of *air* in the vessels of the pia mater, under circumstances which preclude the possibility of their being the result of putrefactive decomposition. I have repeatedly noticed this phenomenon in my own dissections, and cases of the kind are related by numerous writers. Whether the fluid is the product of a process of secretion, as has been maintained by some pathologists, or whether it is caused by the introduction of the air in consequence of injury done to the vessels of the pia mater, or of its passage along the carotid artery or jugular vein, are questions which are still unsettled. The gas generally presents itself in the form of white pellucid globules, looking like small pearls, movable, and contrasting strikingly with the natural contents of the vessels.

## SECTION III.

### SPINAL CORD AND ITS ENVELOPS.

Having already dwelt at considerable length upon the anatomical characters of the various lesions of the encephalon, it only remains to make a few remarks concerning those of the spinal cord; and these will be so much the more concise, inasmuch as the foregoing observations embrace nearly all that might otherwise be necessary to be said under the present head.

*Inflammation* of the spinal cord may be traumatic or idiopathic; and, if not timeously arrested, may pass into suppuration, the matter being of a pale straw-color, of a thin cream-like consistence, and either infiltrated through the proper substance of the cord, or collected into a distinct abscess. Both occurrences are rare, especially the latter, for the reason that life is usually destroyed before the morbid action reaches the suppurative stage. Abscesses in this situation occasionally attain a considerable bulk, and are invested by a distinct cyst, of a firm consistence, and upwards of half a line in thickness. The nervous structures around are always much softened, or even converted into a thin, diffluent substance, and the lining membranes exhibit marks of high inflammation.

*Softening* of the spinal cord is not uncommon; it may be partial or general, and in some instances it is limited entirely to the internal gray substance. Cases occur in which the disorganized texture exhales an odor similar to that of sulphuretted hydrogen.

*Induration* of the spinal cord, although it chiefly affects the white substance, is sometimes entirely confined to the gray. The affection may embrace the whole cord, from one extremity to the other. In such cases, the induration may be so great as to enable the organ, after being divested of its tunics, to resist considerable efforts at lacerating it.

*Hypertrophy* of the spinal cord is uncommon, much more so, indeed, than of the brain. The affection is characterized by the enlargement and extreme firmness of the cord, with diminution of the natural vascularity, and has hitherto been noticed principally in children. Occurring generally in isolated portions, the hypertrophy is sometimes observed throughout the whole extent of the cord, which may attain such a volume as to fill almost completely the vertebral canal.

*Atrophy* of the spinal cord is occasionally observed. When general, as it sometimes is, the cord is reduced, throughout its whole extent, in bulk. In most instances, however, the atrophy is partial, or limited to particular portions. The spinal cord is sometimes absent as a congenital defect; and instances are occasionally observed in which it is hollow, at the expense, evidently, of the central gray substance.

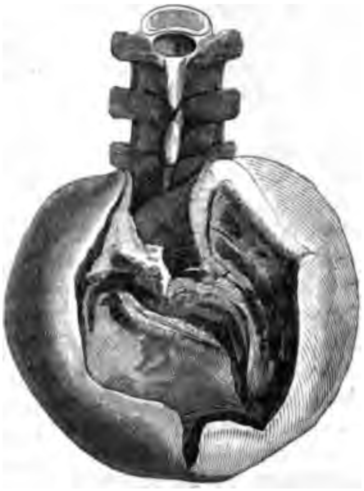
*Tubercles*, acephalocysts, sanguineous and serous effusions, and various kinds of tumors, are met with in the spinal cord, or in its membranes; but these it is unnecessary to describe, inasmuch as they are precisely of the same nature as in the brain. Ulceration of the spinal cord has not been described as a distinct lesion.

*Hydro-rachitis* is a congenital defect, consisting in a cleft condition of the vertebral column, with a protrusion of the lining membranes of the spinal cord. The lesion, which is evidently caused by an arrest of ossification, and a consequent deficiency of the vertebral rings, is generally situated in the lumbar region, but occasionally it affects the dorsal or cervical portions, or even those of the sacrum. It is frequently associated with hydrocephalus, and is analogous to those malformations which originate from a want of union of the two halves of the fœtus during utero-gestation, such as hare-lip, cleft-palate, and opening of the linea alba.

The malformations of the spinal column accompanying this affection may be arranged under the following heads: 1, division of the entire vertebra, even of its body; 2, partial or complete absence of the lateral arches; 3, perfect development of the lateral arches with want of union at the median line. Of these varieties the first is very rare; it may occur in any portion of the spinal column, even in the atlas and sacrum, and, when the cleft is considerable, the hydro-rachitic tumor may project into the abdominal cavity, immediately behind the peritoneum. In the second form of the affection, all the arches may be wanting on both sides, or they may exist on one side, and be absent on the other. They are frequently very short, stunted, curved or distorted, and even fused together, either in part, or in whole, by bony or cartilaginous matter. In the third variety, the lateral arches are well formed, but open behind. The cleft varies in breadth from a few lines to half an inch or upwards. Occasionally, though rarely, the arches are bent outwards, so as to form a plane continuous on each side with the body of the bone. These three varieties, which may involve one or more pieces at the same time, are generally associated with defective development of the spinous processes.

The protrusion of the spinal envelops generally takes place during the latter months of fœtal life; occasionally, however, it is not observed until some weeks or months after birth. When the tumor first shows itself, it is perhaps not larger than a pea; but, as the disorder progresses, it gradually increases in size, varying in proportion to the deficiency of the vertebræ. Although the swelling does not, in the plurality of cases, exceed the size of an orange, yet occasionally it reaches that of the fist, or even of the patient's head. The skin is commonly very smooth, delicate and thin; sometimes, how-

Fig. 113.



Bifid spine, the sac being laid open. From a preparation in my collection.

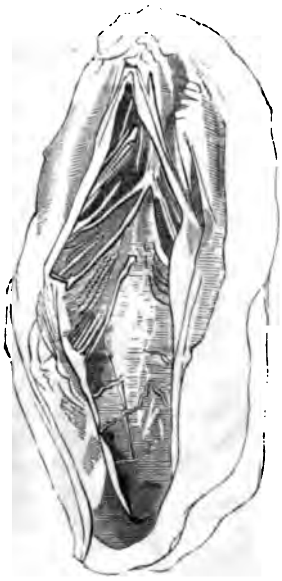
ever, it retains its normal thickness, or it becomes red, rugose, and horny; in a few rare cases, it is entirely wanting. The tumor is either soft, flabby, and fluctuating, or it is full, hard, and shining; when pressed upon, it gradually diminishes in volume, or completely recedes; but no sooner is the force removed than the fluid re-accumulates, and the part regains its previous bulk. In its form, the swelling is globular, ovoidal, or pear-like, with a short, narrow neck, by which it reposes upon the cleft bone. Fig. 113, from a preparation in my possession, exhibits a tumor of this kind in the lumbar region; it was about the size of a common orange, and was taken from a child five months old. Its cavity, which is here laid open, had been exposed by ulceration.

The fluid of a tumor of bifid spine is generally of a thin, limpid character, slightly saline in its taste, and almost uncoagulable. The best analysis that has been furnished of it is by Berzelius, according to which it consists of the following ingredients:—

| | |
|---|---|
| Water | 97.8 |
| Muriate of soda | 1.0 |
| Albumen | 0.5 |
| Mucus | 0.5 |
| Gelatine | 0.2 |
| | 100.0 |

In some instances, the fluid is of the color and consistence of synovia, or it contains flakes of lymph and particles of pus. These appearances are seldom present until after the tumor has burst, and discharged its original contents. In regard to its precise seat, it may be mentioned that it is most frequently found in the arachnoid sac, but occasionally it has been known to exist between it and the pia mater, between it and the dura mater, and sometimes, though rarely, in all these situations at the same time. The tumor usually consists of a single cyst; but there may be several, as in the multilocular variety of ovarian dropsy. In such a case it would be difficult, if not impossible, to draw off all the fluid by operation.

Fig. 114.



Bifid spine, showing the distribution of the nerves. From a preparation in my cabinet.

The contents of the vertebral canal in the immediate neighborhood of the lesion are variously affected. The portion of the spinal cord surrounded by the tumor is often very much softened, or converted into a thin, diffluent substance; sometimes it has been found abnormally hard; sometimes it is not so large as natural; and sometimes it deviates remarkably from its accustomed route, being forced through the opening in the vertebræ, and partially contained in the swelling. The nerves are always more or less displaced, and, in some instances, they are dragged out of the spinal canal, and distributed over the internal surface of the cyst in a beautiful plexiform manner, not unlike that of the fleshy columns of the heart. This appearance is well seen in Fig. 114, from a specimen in my collection. The arachnoid membrane and dura mater are usually not much altered in the early stage of the affection; but as the fluid accumulates, they become excessively attenuated, and, together with the superimposed skin, finally give way at one or more places. When this happens, the parietes of the tumor shrink, and become greatly thickened, by the deposition of plastic lymph upon their interior. A thin, turbid fluid, mixed with pus, continues to exude from the part, and the patient is rapidly carried off by constitutional irritation. The preternatural aperture is ordinarily limited to the posterior surface of the bone, but it may extend through its whole substance, so that the finger may be readily passed into the abdomen, or coils of intestine find their way into the tumor.

## SECTION IV.

### NERVES AND THEIR GANGLIA.

1. The nerves are liable to acute and chronic inflammation, suppuration, ulceration, gangrene, hypertrophy, atrophy, and different kinds of tumors.

When a nerve is cut across, restoration generally takes place in a short time by the adhesive process, the small cicatrice thus formed offering no obstacle to its functions. When a portion is removed, the divided extremities, in the course of twenty-four hours, become enlarged and vascular, and the surrounding cellular tissue, taking on inflammation, pours out coagulating lymph, which finally incloses and cements them together. After some time, varying according to the thickness of the nerve, and the distance between the divided ends, the matter thus effused is organized, assuming a whitish, gristly appearance, and the function of the organ is either partially or wholly re-established. Sensibility commonly returns more quickly than voluntary motion. It has been found that the sentient nerves, when thus mutilated, generally begin to regain their functions early in the third week, while the motor nerves do not recover any of their powers till after the fourth. It is proper to observe that, if the interval between the divided extremities is very great, as from one to two inches, the union is either quite imperfect, being effected solely by condensed cellular tissue, or, as is more commonly the case, nature entirely fails in her efforts, and the function of the part is thus permanently destroyed.

In *acute neuritis*, the nerves are of a bright reddish color, and their capillary vessels, which run longitudinally, are united by thousands of transverse twigs, which, in the normal state, always elude the closest scrutiny. When the inflammation is very intense, the affected part generally assumes a dark violet tint, either uniformly diffused, or occurring in small patches, like so many ecchymoses. These changes are always most distinct in the neurilemmic coat; but they extend by degrees to the interstitial cellular substance, which at the same time becomes distended with serous, bloody, or purulent fluid, the natural tendency of which is to separate the filaments of the nerve, and give it a tumid aspect. As the disorder progresses, the affected part loses its peculiar texture, diminishes in strength and consistence, and resembles a cord of inflamed cellular substance rather than a nerve.

Inflammation of a nerve, when artificially induced, always has a tendency to excite inflammation in the organ to which it is distributed. Thus, inflammation of the fifth pair will produce ophthalmia; of the eighth pair, gastritis; but, what is remarkable, not pneumonitis. The reverse of this probably sometimes occurs, the inflammation being propagated from the organs to the nerves.

The anatomical characters of *chronic neuritis* are increased vascularity and consistence of the affected part, with slight swelling and friability. The neurilemmic coat is considerably indurated, the interstitial cellular substance is infiltrated with serous fluid, and the capillary vessels are often so much loaded as to exhibit a varicose arrangement. This affection, which is probably much more common than has been imagined by pathologists, is almost always attended with severe pain, and, like the acute form, may be confined either to a small portion of a nerve, or diffused over an extent of several inches.

*Suppuration* of the nerves is very rare. The matter, which is commonly of the character of healthy pus, is usually infiltrated into the interfibrillar cellular tissue, in which it appears to be originally formed, the nervous substance itself being little altered. Occasionally the pus lies immediately beneath the neurilemmic coat, which it raises in the form of a little abscess. Hemorrhagic effusion was found by Martinet in the sciatic nerve of a man who had been affected with excruciating pain in the posterior part of the thigh, aggravated to almost absolute intolerance by the least motion; and Cotunni noticed, long ago, that serous infiltration is often connected with neuralgia.

*Ulceration* of the nerves is still more rare than suppuration. It never occurs spontaneously after inflammation, but is always dependent upon injury or disease of the adjacent structures. In a case of ulceration of the peroneal nerve, reported by Mr. Swan, of London, there was a fungous ulcer of the leg, with violent pain of the whole limb, which rendered it necessary to amputate.

*Gangrene* of the nerves, like ulceration, is generally complicated with lesion of the surrounding parts, being seldom, if ever, present as a primary affection. In whatever manner it may be induced, the nerves are of a dark brownish color, highly offensive, and converted into soft pultaceous cords, entirely destitute of their natural characters. The parts immediately above and below the seat of the disorganization are of a reddish tint, swollen, and infiltrated with serous fluid.

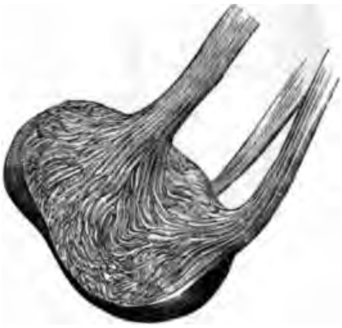
*Carcinoma* seldom affects the nerves, at least very few well-authenticated cases of this disease are to be found on record. It has been witnessed in the external saphenous nerve, the posterior tibial, the trifacial, and the median, and I have myself met with it in the optic nerve. Berard has related an example, the only one of which I have any knowledge, of melanosis of these cords. The heterologous matter was embedded in the right phrenic nerve, and presented itself in the form of a blackish tubercle, of the volume of a small pea, and of a firm dense consistence.

Of *tubercular* disease of the nerves hardly anything is known. Nélaton has related a case in which this deposit took place in the origin of the third, fifth, seventh and eighth pairs of nerves, which were all very much enlarged, and the seat of small spheroidal tumors, from two to three lines in diameter, and composed of yellow, opaque matter, evidently of the nature of that in question. The subject was a female twenty-one years of age.

The nerves are occasionally found in a state of *hypertrophy*. In chronic affections of the leg, nothing is more common than to see the subcutaneous nerves thickened and injected. In dissecting, not long ago, the left leg of a man, thirty years old, removed for caries of the tarsal bones, I found the posterior tibial nerve, nearly in its whole length, very much indurated, and at least three times as thick as usual, all its fibres being extremely distinct and well defined. The nerves of the womb are hypertrophied during pregnancy, and the same phenomenon is frequently observed in subcutaneous and other tumors.

*Atrophy* of the nerves, a state the reverse of that just described, generally arises from mechanical injury, or the pressure of a tumor; yet that it occasionally exists as a primary affection seems undeniable. Whenever an organ of sense is destroyed, the nerve leading to it wastes, usually by degrees, but sometimes with great rapidity. In such cases, the nerve assumes a peculiar buff-colored appearance, and often shrinks to less than one-third its normal bulk, its pulpy substance being sometimes totally absorbed, so as to leave nothing but the dense and indurated neurilemma.

Fig. 115.



Section of a neuroma; three nervous trunks terminating in it. The fibrous arrangement shown, as observed by the naked eye.

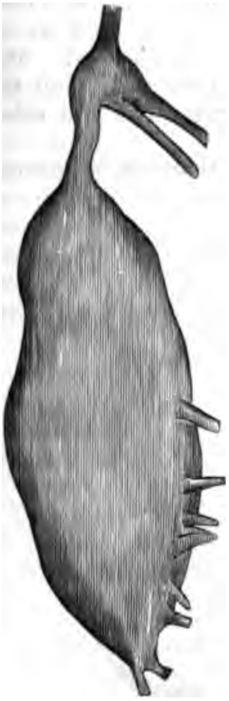
*Neuromatous tumors*, the anatomical characters of which are variable, are sometimes developed in the nerves, the component threads of which they separate from each other like the ribs of a fan. They occur most commonly in the nerves of the upper extremity, especially the radial and ulnar, and are generally attended with severe pain and numbness; at times they are found on nearly all the spinal nerves of the body. The origin of these tumors is still involved in obscurity; in some instances, they are evidently connected with the nervous substance;

whereas, in others, they arise, with equal certainty, from the neurilemmic covering. In a case mentioned to me by Professor Parker, the tumor, about the size of a hen's egg, was developed in the centre of the ulnar nerve, the fibres of which it forced apart, and was of a compact solid texture.[1] This is, perhaps, the most ordinary structure of these swellings; but, occasionally, they are composed of a dense cyst, filled with a transparent jelly-like fluid. Their magnitude seldom exceeds that of a walnut; in most cases, indeed, they are not larger than a pea, filbert, or peach-stone. After amputation, the ends of the divided nerves are sometimes expanded into white, semi-cartilaginous bulbs, which frequently become the seat of morbid sensibility and neuralgia.

2. Concerning the lesions of the *ganglia*, very little is known. That they are liable, like the nerves with which they are connected, and of which they are a part, to inflammation and some of its more ordinary consequences, would seem probable, from the similarity of their structure; but what the resultant changes are, the present state of the science does not enable us to point out.

A number of examples of considerable increase of bulk of the ganglia of the sympathetic, from the influence of chronic irritation, are recorded. The enlargement, which has been known to exceed six or eight times the normal size, is met with chiefly in the cervical ganglia; but, occasionally, it has been seen in those of the thorax and pelvis. A remarkable case of hypertrophy of these bodies, probably produced by chronic inflammation, has been published by Cruveilhier; he observed it in a subject in the dissecting-room of the "Ecole Pratique," of Paris, concerning the previous history of which nothing whatever could be learned. All the cervical ganglia of the left side were enormously enlarged, especially the middle, which was two inches and a half in length by one inch in thickness. (Fig. 116.) They were of a grayish-white color, and of a very dense, compact consistence, creaking very sensibly under the knife. On further examination, they were found to be of a fibrous structure, arranged in such a manner as to form a great number of cells, filled with a sort of gelatinous substance. The component nervous filaments were in a state of complete atrophy, the only part that was left being

Fig. 116.



Hypertrophy of a nervous ganglion.

---

[1] A beautiful tumor of this description, developed in the substance of the peroneal nerve, is contained in my private collection, having been kindly sent to me by Drs. Hoffman and Dalton, of Logan, Ohio.

their neurilemmic covering. The nervous cords between the diseased ganglia, as well as those which passed off from them, were very much enlarged, of a pale-grayish color, and abnormally firm in their consistence.

# CHAPTER XII.

## EYE.

I. *Lesions of the Lachrymal Apparatus.*—Lachrymal Gland.—Ducts and Sac.—II. *Lesions of the Ball of the Eye.*—The Conjunctiva.—Pterygium.—Lachrymal Caruncle.—Acute Corneitis.—Ulceration and Ossification of the Cornea.—Fleshy Excrescences.—Alterations of Form.—Diseases of the Sclerotica.—Choroid Tunic.—The Retina.—Amaurosis.—Optic Nerve.—Membrane of Demours.—Hæmophthalmus.—Lesions of the Iris.—Alterations of the Pupil.—Capsule of the Crystalline Lens.—Liquor of Morgagni.—Varieties of Cataract.—Vitreous Humor.—Heterologous Formations.

SEVERAL structures, entirely different from those in other organs, enter into the formation of the eye. Altogether it is a most complicated apparatus; and hence, as might be expected, the diseases to which it is subject are at once numerous and interesting. This renders it incumbent upon us to consider them somewhat in detail.

## SECTION I.

### LACHRYMAL APPARATUS.

The lachrymal gland is liable to inflammation, but the disease is so rare that its anatomical characters still remain uncertain. So far, however, as our observation extends there is reason to conclude that they are similar to those of other glandular organs. In the early stage of the disorder, there is merely an augmented flow of tears, with slight uneasiness in the situation of the gland: as it progresses, however, the natural secretion diminishes, and the movements of the eye become constrained and painful. The vessels of the little body are engorged with blood, its substance assumes a deep reddish complexion, and the interlobular cellular tissue is infiltrated with serous fluid, the swelling from this source being sometimes quite considerable. When the inflammation is violent, it may terminate in suppuration, but this is extremely rare. When matter forms, it usually points above the upper lid; occasionally, it escapes into the cellular tissue of the orbit, and gradually works its way out through a fistulous opening.

There is a *chronic* form of the disease, in which the gland often becomes hypertrophied, and acquires a firm, compact texture, not unlike an indurated pancreas. The enlarged organ either remains stationary, or it passes into tedious and imperfect suppuration: the disease is most frequent in scrofulous children, and is seldom attended with much pain. Chronic inflammation sometimes produces atrophy of this gland. I once dissected an encephaloid eye, in which this body was reduced to the size of a small bean, its substance being indurated, and of a yellowish-drab color. The subject of the disease was a child ten years of age.

The lachrymal gland is liable to *scirrhus*, forming a hard, elastic, lobulated mass, of the consistence of fibro-cartilage. Under these circumstances the organ may be larger than an almond, or even of the size of a hen's egg. Its substance is of a white grayish color, dense, crisp, and intersected by membranous bands, resembling the interior of an unripe pear. Small cysts, filled with thin, glairy fluid, or with firm fatty, melliceric, or sebaceous matter, are sometimes interspersed through the diseased mass. Scirrhus seldom occurs before the middle term of life.

*Serous cysts*, containing a thin limpid fluid, have been found in the lachrymal gland. Although generally very small, they have been observed, in a few cases, to be as large as a hen's egg. It has been supposed that these cysts are identical with hydatids; but the more probable opinion is, that they are nothing but dilated excretory ducts: a conjecture which receives corroboration from the fact that these tumors are generally distended with a fluid possessing all the properties of the lachrymal secretion, being of a thin, watery consistence, and of a sharp, saltish taste.

It occasionally happens that one of the *excretory ducts* of the lachrymal gland becomes dilated near its terminal extremity, forming a circumscribed, elastic swelling, immediately behind the upper lid, towards the temporal side of the orbit. It is semi-transparent, unusually delicate, and of an ovoidal shape, and often attains the size of a pigeon's egg, though generally it does not exceed that of a hazel-nut.

The *lachrymal ducts* are liable to inflammation, which sometimes ends in suppuration, at other times in the obliteration of their caliber. Similar lesions occur in the *nasal canal.* The obliteration here, however, is usually partial, existing in the form of a stricture. Though the nasal canal is scarcely half an inch in length, there are three points in its course at which stricture may be located, namely, at its junction with the lachrymal sac, at its middle, and at its entrance into the nostril. The disease is produced in the same way precisely as stricture of the urethra; that is, by inflammation of the lining membrane, accompanied by effusion of lymph into its substance, and into the subjacent cellular tissue. Permanent obstruction, either partial or general, may also be produced by inspissated mucus, and by fibrin poured upon the free surface of the membrane.

M. Bouchardat[1] has recently published the case of a woman sixty-six years of age, whose lachrymal canal contained a calculus, weighing four-tenths of a grain, and composed of the following ingredients:—

---

[1] Annales Oculistique, Juillet, 1842.

| | |
|---|---|
| Carbonate of lime | 48 |
| Phosphate of lime and magnesia | 9 |
| Concrete albumen | 25 |
| Mucous matter | 18 |
| Fat and chloride of sodium, a trace. | |
| | 100 |

The diseases of the *lachrymal sac* do not require special notice, as they do not differ from those of other mucous textures. Suppuration often occurs here, and the matter, being unable to find its way down into the nose or up into the eye, is apt to escape through the skin, leaving a fistulous aperture, which it is always difficult to heal.

## SECTION II.

### BALL OF THE EYE.

1. Acute *conjunctivitis* is announced by more or less redness, which usually begins at the palpebral portion of the membrane, and gradually extends to that over the sclerotica. The injection is at first arborescent; by and by it becomes capilliform, and, in certain cases, it is so close as to give the organ the appearance of being bloodshot. With this augmented redness, the membrane loses its natural polish, the temperature of the part is augmented, its sensibility is altered, and there is a suppression of the mucous as well as of the lachrymal secretion. The discoloration now becomes more and more vivid and intense; the conjunctiva assumes a villous aspect; serosity is poured out into the cells of the ocular fascia; the tears flow in great abundance; and the mucous discharge is not only restored, but uncommonly copious. Blood is sometimes extravasated beneath the conjunctiva; and occasionally there is a secretion of lymph, by which the margins of the lids are completely agglutinated. In violent cases, such as we have here described, the disease is frequently propagated to the other textures of the eye, and the discoloration extends backwards to the posterior section of the sclerotica.

Acute conjunctivitis often passes into *suppuration*. The matter, which is at first merely puriform, becomes gradually purulent, thick, and of a yellowish straw color. The quantity secreted is sometimes surprisingly great—much more so than in any other mucous membrane of equal extent—from four to eight drachms being discharged in the twenty-four hours. Like the matter of gonorrhœa, it is frequently of a highly acrid and irritating nature, and has the property, when applied to the sound eye, of engendering the same affection. Many surgeons have disbelieved this; but the experiments of Guillé, Hupsch, Kirkhoff, and others—which consisted in inoculating different persons with matter taken from patients afflicted with ophthalmia

—have affirmatively settled the point. The disease, when thus produced, usually appears in from one to three days.

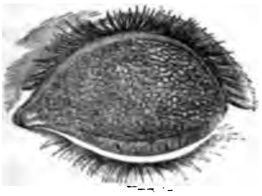
There is a variety of this disease in which the effusion of serosity is so great as to give the eye a truly *œdematous* aspect. The sclerotic portion of the conjunctiva is elevated into a soft, transparent tumor, forming a ring around the cornea, which appears deeply sunk, and sometimes almost entirely concealed: the effusion often encroaches considerably upon the lids, which are thus rendered tumid and everted. Very little vascularity attends this variety of ophthalmia. In severe cases, the conjunctiva has been known, from this cause, to form a tumor as large as a walnut.

In another series of cases the mucous membrane is raised into small *vesicles*. Seated in the subjacent cellular tissue, they are produced by an effusion of serous fluid, and seldom exceed the size of a common pin-head; they are of a spherical shape, diaphanous, and most frequent in that species of ophthalmia which affects the conjunctival covering of the cornea. Their number is sometimes considerable; on bursting, they leave an ulcer which it is often difficult to heal.

The corneal portion of the conjunctiva is also liable to the formation of vesicles. Occurring in persons of all ages, they are most frequently met with in children, and sometimes spread through whole families, being generally concomitant of smallpox, measles, and aphthous affections of the mouth. The vesicles are usually situated near the margin of the cornea, are encircled by minute vessels, and appear like small dusky spots, of a pale reddish color, slightly elevated above the level of the surrounding surface. If the inflammation be allowed to go on, purulent matter is formed, their apex ulcerates, their contents are discharged, and a cavity is left, the edges of which are dense and opaque.

*Chronic*, like acute inflammation, usually begins in the palpebral conjunctiva, and is often entirely confined to that part. The membrane, which is of a uniform reddish color, verging on purple, is thickened by an effusion of lymph, and converted into a dense, fleshy-looking substance. Its surface is always more or less rough; and, in many instances, it is studded with small, spherical bodies, improperly called *granulations*. (Fig. 117.) These bodies are generally dispersed over the whole surface of the lids, especially the upper, and seldom extend over the sclerotic and corneal portions of the membrane. Being of a soft, fleshy consistence, they are of a florid color, extremely vascular, highly sensitive, and liable to bleed on the slightest touch. The size which they attain, in purulent ophthalmia, is sometimes surprising. It is probable that these vegetations are nothing but enlarged villosities, with which the surface of the membrane, like every other of a similar kind, is naturally covered.

Fig. 117.

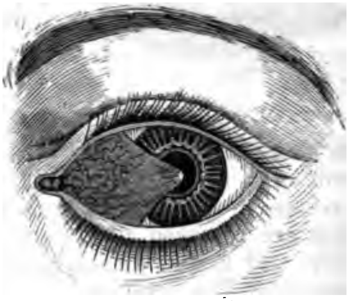


If the inflammation recurs from time to time, or is unusually protracted, the vessels of the conjunctiva become permanently enlarged.

The veins, especially, may be observed to be tortuous, of a dark color, and irregularly nodulated, like varicose veins in other parts of the body. The arterial capillaries participate in the enlargement; and there is generally considerable thickening, with opacity and relaxation of the conjunctiva: the lachrymal caruncle is hypertrophied, as are also the Meibomian follicles, and the secretion from these structures is unnaturally thick and copious.

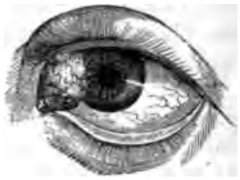
A membrane occasionally forms on the conjunctiva, producing what is called a *pterygium* (Fig. 118); it is most common in old people, though no age is exempt from it. It is generally of a flat, triangular shape, with the apex directed towards the pupil; has a fleshy look and consistence; and almost always grows at the internal angle, tending, in its progress, to encroach upon the cornea. Its vascularity is often quite great, the vessels running in a straight line, and presenting a varicose state, especially when of long standing. In most instances, the morbid growth is soft and movable; now and then, however, it is found firmly adherent, thick, hard, and coriaceous. Two pterygia sometimes form on each eye.

Fig. 118.



2. The *lachrymal caruncle* is sometimes hypertrophied, forming what is called *encanthus* (Fig. 119). This structure is naturally quite small; but, when diseased, it often acquires the volume of a pea, or even of a cherry. It is generally of a pale reddish color, and of a soft fleshy consistence, with a rough tuberculated surface. Sometimes it is very dark, and almost black.

Fig. 119.

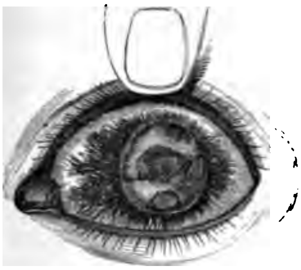


Encanthis.

3. The healthy *cornea* readily unites when divided, the process by which this is effected being the same as in other parts of the body. If a portion be removed, it is never completely regenerated; but the chasm is filled up with an opaque substance, of a hard, fibro-cartilaginous consistence.

Although *acute corneitis* occasionally arises without any assignable cause, yet, in most instances, it is directly chargeable to external violence. In the early stage of the disease there is scarcely any perceptible alteration in the part concerned, the only change being a slight degree of haziness. By and by, however, the membrane loses its transparency, assumes a bluish milky aspect, softens, and becomes distinctly vascular, hundreds of vessels, extremely fine and delicate, running in every direction from the circumference towards the centre. In aggravated cases, blood is sometimes effused into the substance of the cornea, or the capillary injection is so great as to give the membrane the appearance of a piece of scarlet cloth. Very often a red zone is seen around the fore part of the sclerotic coat, formed by a wreath of vessels which freely anastomose with those of the cornea. The anterior surface of the membrane is occasionally quite rough, and the conjunctiva is generally extensively implicated: in strumous habits, the inflammation frequently spreads to the iris, the choroid, and the retina, leading to great and permanent mischief.

Fig. 120.



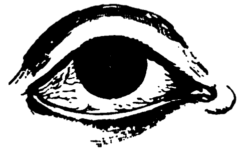
Corneitis.

Acute corneitis sometimes passes into *suppuration*. The matter collects either immediately beneath the conjunctival covering, or else between the lamellæ of the proper substance of the membrane, and generally appears in the form of a small abscess. This gradually increases in size, until it produces a considerable prominence, when it either bursts, or its contents are removed by absorption. The pus, which is usually very white and mixed with lymph, occasionally escapes into the anterior chamber. The parts immediately around the abscess are always more or less softened, vascular, and opaque.

In violent grades of inflammation, especially when occurring in persons of a strumous habit, the cornea sometimes loses its vitality, and is detached in grayish, dirty-looking eschars, leaving one or more openings through which the iris protrudes. Some anatomists have doubted whether the cornea is susceptible of this change; but careful observation has fully settled the question. The change is most apt to take place in the pustules which form on the eye in cases of confluent smallpox.

In *chronic* corneitis, the membrane is opaque, of a grayish tint, condensed, indurated, and thickened, yet more easily torn than in the healthy state. Vessels may be traced over its anterior surface, which are much larger than in the acute form of the complaint, and their contents are also of a darker hue. Little pain is present; objects are perceived indistinctly, everything having a hazy appearance; and, if the cornea is incised, it is generally slow in uniting. In cases of very long standing, the thickening and opacity of the cornea are sometimes very great: the surrounding textures are deeply implicated, and the ball of the eye appears as if covered with a strong fascia, the fibres of which converge towards the centre of the cornea, and exhibit a yellowish pearly lustre, not unlike the inner surface of an oyster-shell.

Fig. 121.



*Ulceration* of the cornea (Fig. 121) is a very common consequence of the bursting of an abscess; but it may also take place without any antecedent suppuration. A species of softening sometimes precedes this process, leading to the formation of numerous erosions, so exceedingly minute as almost to escape the naked eye: they are superficial, rough, irregular, and without any circumjacent vascularity. In the majority of cases, however, the ulcer presents a more decided character; it is deep, well-defined, and of a pale ash color, with high, jagged edges; its surface is bathed with a thin, acrid fluid; the part is extremely sensitive; and the sore manifests a strong tendency to spread in depth and diameter. In this manner the disease often progresses until the cornea gives way, followed by an escape of the aqueous humor, if not a total destruction of the organ. In old people we sometimes meet with superficial crescentic ulcers situated near the circumference of the cornea.

Ulcers of the cornea, of whatever form or extent, are susceptible of *cicatrization.* Frequently, after they have existed for a while, their progress seems to be suddenly arrested; the eye becomes less irritable; granulations appear; and thus the excavation is gradually filled up, the new texture at length assuming the properties of the old. Most generally, however, the reproduction is imperfect, the cicatrice which is left being opaque, and depressed in the centre.

The lymph effused in inflammation sometimes remains unabsorbed, and gives rise to *opacity.* This occurs in every intermediate degree, from a slight haziness to entire loss of transparency, and may be either superficial or deep-seated, circumscribed or diffuse, punctiform or linear, circular or crescentic. In many cases, the opacity continues through life, the lymph upon which it depends becoming organized and thoroughly incorporated with the pre-existing tissues.

*Fatty degeneration* of the cornea is witnessed chiefly at the outer circumference of this membrane, at or near its junction with the sclerotica, and constitutes what is called the senile arch. The affected part is of a dim pearly aspect, loaded with oily matter, and a good deal softer than the adjacent healthy structure, in which it appears to be abruptly lost. In many cases it forms a complete circle around the circumference of the cornea. Mr. Canton, of London, who has paid particular attention to this affection, is of opinion that it is generally associated with fatty degeneration of the heart and other viscera, and is inclined to lay great stress upon its occurrence as a diagnostic sign of this disease. The change is by no means peculiar to the old, as the term senile arch would lead us to infer; on the contrary, it is often witnessed in middle age, and occasionally even long before. I have myself seen several cases of it before the twentieth year. The white spots on the cornea, constituting various forms of opacity of that membrane, occasionally undergo the fatty degeneration.

The cornea is liable to *ossification.* Wardrop saw a case in which the whole eye had changed its form, and the cornea contained a hard, smooth, oval plate of bone, weighing two grains. A piece of bone was also found between the choroid coat and the retina of the same eye.[1] In another case, referred to by Voigtel,[2] a German author, a piece of cornea, taken from a man sixty years of age, was converted into osseous matter. It was three lines long, two broad, and weighed two grains. A still more remarkable example is reported by Dr. Monet, in the *Nouvelle Bibliothèque Médicale*, for May, 1817. It occurred in an old man, and the cornea is said to have been ossified throughout. The transformation is by no means so frequent as the cartilaginous, of which a considerable number of instances are related by authors.

---

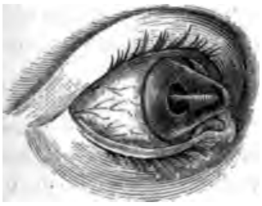
[1] Morbid Anatomy of the Eye, vol. i. p. 74. Second edition. London, 1834.

[2] Handbuch der Pathologischen Anatomie, b. ii. p. 92. Halle, 1804.

*Fleshy excrescences* occur on the cornea. They are occasionally of a fungous character, and in a few instances they have been found to contain hair. These morbid growths appear to have their origin, for the most part, on the conjunctival covering of the cornea.

Alterations in the *form* of the cornea occur under two principal varieties, the conical and spherical. The conical (Fig. 122) is sometimes congenital, or begins soon after birth; more commonly, however, it does not come on until about the age of puberty. The alteration generally advances slowly, and occasionally affects both eyes, though seldom in an equal degree. The cornea, which is at first only somewhat prominent, gradually assumes the conical shape, and has a peculiar sparkling, crystalline appearance, preventing the pupil and iris from being distinctly seen. After awhile, small whitish specks are observed, which sometimes coalesce until the whole structure is rendered perfectly opaque. In some instances ulceration sets in, and is eventually succeeded by a protrusion of the iris. Both in this and in the next variety, the surface of the staphylomatous protrusion displays arborescent vessels, conveying red blood, and, when the tumor is large, acquires a cuticular incrustation.

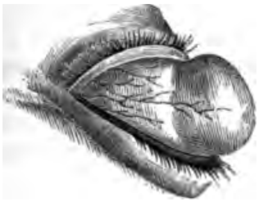
Fig. 122.



Conical cornea.

In the other variety (Fig. 123), which is the more common, and which usually follows ulceration, or the bursting of an abscess, the cornea forms a whitish, pearl-colored projection, of a spherical figure, and often of considerable magnitude. The membrane is unequally thickened; its laminar arrangement is destroyed; its texture is generally more or less softened; and numerous vessels can be seen towards its circumference, and sometimes even towards its centre. In this variety the anterior chamber of the eye is annihilated; the iris is torn into radiated fragments; and vision is lost or impaired, according to the extent of the projection and the opacity of the membrane.

Fig. 123.

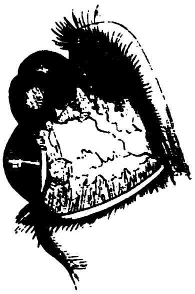


Staphyloma.

A *cyst*, containing a thin watery fluid, is sometimes found in the cornea, growing between its lamellæ, and liable to reappear after the evacuation of its contents. It is apparently of a serous structure, but its precise nature is not ascertained.

4. The *sclerotic* coat, like other fibrous textures, takes on inflammatory action with great reluctance; but the disease, after having once set in, is always obstinate, painful, and difficult of cure. It is generally confined to the anterior half of the membrane, is very apt to involve other parts of the eye, especially the conjunctiva, cornea, and iris, and is most frequently observed in persons of a gouty and rheumatic predisposition, its favorite period of attack being the spring. It is characterized by deep-seated redness of the eyeball, verging upon lilac, unaccompanied with thickening or opacity. The distended vessels form a beautiful zone about a line behind the cornea, whence they proceed backwards in a radiating direction, until they gradually lose themselves in the posterior part of the organ: they do not branch out like those of the conjunctiva, nor are they so movable under the folds of this membrane. Coagulating lymph is rarely poured out by the sclerotic coat when inflamed, and the membrane seldom, if ever, suppurates. In chronic cases, the redness is considerably diminished, the affected part is rendered preternaturally flaccid, and the whole eyeball assumes a sickly yellow hue.

Fig. 124.



Staphyloma of the sclerotic coat, seen in profile.

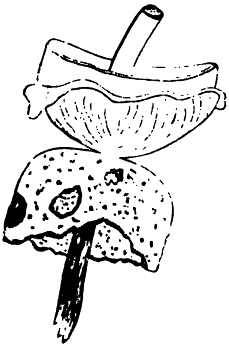
The sclerotic coat is sometimes remarkably thin and flaccid, so as to be incapable of maintaining the globular shape of the eye. This state is usually connected with disease of the other membranes, and with disorganization of the vitreous humor. When the attenuation is very great, a portion of the tumor may bulge out as a staphylomatous tumor, soft to the touch, and of a dark bluish color (Fig. 124). On the other hand, the sclerotic coat is sometimes unnaturally hard and thick, and it has been found even partially ossified.

5. In inflammation of the *choroid*, there is little external redness, and the enlarged vessels which appear on the white of the eye are deep-seated, corresponding to the posterior ciliary arteries. When the disease is violent, suppuration may take place; not unfrequently there is an absorption of the black pigment, or this substance is deposited in an altered and imperfect manner, or variously changed in color. The membrane is sometimes broken down in its texture, and its inner surface has been found coated with flakes of lymph. Varicose enlargement of the vessels occasionally attends this complaint; but this is rare, except in cases of long standing. The disease is most commonly met with in strong, plethoric persons.

Small cysts, flakes of lymph, and deposits of a thin, glairy fluid, like the white of egg, have been noticed between the choroid and retina.

Ossification of the choroid is quite rare, and has been witnessed chiefly in old persons. Though for the most part partial, the transformation sometimes affects the whole membrane, converting it into a thin, osseous cup, perforated behind for the passage of the optic nerve.

Fig. 125.



Ossification of the choroid.

(Fig. 125.) The disease has been supposed to have its seat in the membrane of Jacob; an opinion which I am inclined to adopt from the fact that this tunic is of a serous texture, which is known to be particularly prone to this kind of transformation.

6. Observations are still wanting to enable us to give a complete history of the morbid anatomy of the *retina.* That this membrane is liable to inflammation cannot be doubted; but, as to the changes which it undergoes when thus affected, nothing satisfactory is known. Wardrop once saw it of a buffy color, produced, as he supposes, by an effusion of albumen; in another case he found it quite opaque, tough, and thickened. Magendie noticed an instance where the retina was converted into a white, firm, fibrous structure, analogous to an aponeurosis. Cases occur in which this membrane is partially atrophied, or even completely wasted, as in persons who have long been affected with amaurosis.

In *amaurosis* the vessels of the retina become enlarged and varicose. This change very probably takes place in those cases of the disease which are dependent upon cephalic congestion, and which are characterized by figures of various forms floating before the eyes. The disease may sometimes be relieved by depletion; but, in the generality of cases, it remains permanent and irremediable. Amaurosis often depends upon a deranged condition of the chylopoietic viscera, by correcting which the patient speedily recovers his sight; in other cases, it is owing to disease of the optic nerve, or even of the brain; in others, it seems to arise from a palsied and disorganized state of the retina itself. In persons who have been long blind, the retina is altered in color, and changed in consistence, being either firm and fragile, or soft and pulpy.

7. The *optic nerves* are liable to disease. They have been found much reduced in size. Sometimes they are flattened, like pieces of tape, and of a yellowish, cineritious, or brownish hue. Occasionally they are the seat of calcareous concretions, of fibrous tumors, and of hydatids, although these affections are extremely rare.

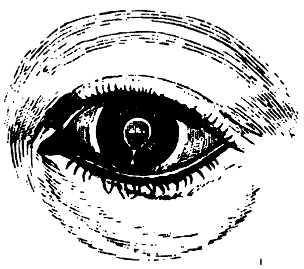
8. The membrane of Demours, which furnishes the aqueous humor, is liable to inflammation, constituting what has been termed *aquo-capsulitis.* In this condition it is rendered more or less opaque, and pours out globules of lymph, some of which, becoming detached, float about in the anterior chamber, or form adhesions with the iris and the adjacent parts. The aqueous humor is at the same time rendered turbid, and so abundant as to give the eyeball an unusual degree of prominence. Besides these phenomena, the posterior surface of the cornea often presents small milk-like specks, environed by a sort of disk, giving the membrane a singularly mottled appearance, and regarded as characteristic of the disease. No capillary injection is noticed in this inflammation, though the vessels of the surrounding parts are often very much distended, especially those of the sclerotic coat, which

sometimes form a beautiful zone just behind the cornea. Pus is occasionally poured out, but this is rare.

The lymph that is effused in this disease varies considerably in quantity. When there is only a little, it is generally absorbed; in opposite cases, it is apt to remain and to become organized, red vessels passing through it in different directions. The form of the pupil is often remarkably altered by this substance, and even entirely closed by it. The membrane of Demours is occasionally ossified; and the anterior chamber has been known to be the seat of small pieces of bone, or little earthy concretions.

9. The *aqueous humor*—the product of the membrane whose diseases have just been sketched—is sometimes altered in quantity or in quality. The fluid in the healthy eye does not exceed five drops; in old people, it is considerably less; and, in certain diseases, it is so much augmented as to constitute real dropsy. The aqueous humor is sometimes quite acrid. The cellular hydatid (Fig. 126) has been repeatedly found in this fluid. In the horse, especially in India, it is sometimes inhabited by a worm, which, in size and color, resembles the common ascaris. The animal, which has received the name of *filaria papillosa*, is about an inch long, of a grayish color, equal in size to a sewing-thread. It has also been found in the ox, buffalo, hare, and hadock. It is seldom met with in birds.

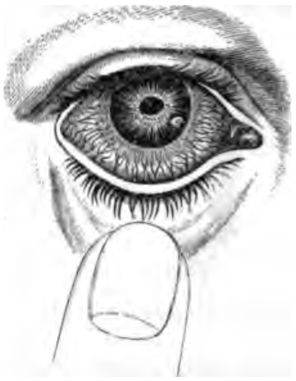
Fig. 126.



Cellular hydatid.

An effusion of blood into the chambers of the eye from mechanical injury, is sufficiently common; but its spontaneous occurrence in persons in other respects well, although sometimes observed, is extremely rare. The lesion is technically denominated *hæmophthalmus*. In some rare instances, the effusion seems to be vicarious of the menstrual function, recurring regularly at the monthly period, and supplying the place of the suspended secretion. In whatever manner the effusion is induced, it generally disappears completely in from two to eight days, leaving the chambers of the eye perfectly clear, and vision unimpaired.

Fig. 127.



Iritis; showing the characteristic vascularity of the globe, the iris clogged with lymph, the pupil contracted and irregular.

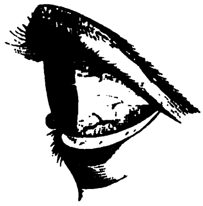
10. One of the most striking phenomena of *acute iritis* (Fig. 127) is the vascular zone around the anterior margin of the sclerotic coat, formed by the minute ramifications of the ciliary arteries. This zone, which is not always complete, varies in distinctness, according to the intensity and duration of the disease. The

vessels composing it seem to terminate abruptly at the circumference of the cornea, very few of them extending forward over its anterior surface or into its substance. The iris itself is discolored, dull, and thickened; the aqueous humor is more or less turbid; and the pupil is contracted, motionless, and irregular. Very frequently, perhaps most generally, the anterior surface of the iris is corrugated, slightly bulging, and covered with globules of lymph, of a whitish, yellowish, or reddish hue. Vessels and spots of blood are sometimes seen upon it; and, occasionally, especially in the more aggravated forms of the disease, the whole membrane has a brick-colored, ecchymosed appearance. Minute abscesses also sometimes form, and, breaking, discharge their contents into the anterior chamber. The quantity of effused lymph is often considerable, and the fluid either floats about in the aqueous humor, adheres to the surfaces of the iris, or fills up the pupil, tying it firmly to the capsule of the crystalline lens. Permanent adhesion of the iris to the lens, and lesion of the internal structures of the eye, are among the dangers which occur if the inflammation be permitted to progress.

There is a very slow, insidious form of iritis, which may be said to be *chronic* almost from the beginning. There is commonly very little redness, and the patient complains chiefly of dimness of vision, which is so gradually impaired, that the sight is lost before he is aware of his misfortune. The most remarkable anatomical feature is the change of color of the iris, which is almost always of a singularly greenish cast; the membrane is also thickened, rough, and puckered, and the pupil is irregularly contracted, and fringed with lymph. The aqueous humor retains, for the most part, its natural aspect; there is little pain or intolerance of light; and the other structures of the eye are little or not at all affected. This form of iritis is generally present when the membrane protrudes from ulceration of the cornea.

*Prolapse* of the iris (Fig. 128), produces a slow change in the texture of this membrane, rendering it unnaturally hard, and altering its form; complete adhesion is often established between it and the cornea; in many cases it is incrusted with partially organized lymph; and occasionally it assumes a granular appearance, resembling a piece of flesh. Small tumors, of the nature of polypes, are sometimes found on the iris; they seldom acquire a large size, and are generally exceedingly vascular, bleeding on the slightest external injury, or even without any assignable cause.

Fig. 128.



Prolapse of the iris.

The *pupil* is liable to various alterations, either congenital or acquired. Thus it has been found to be oval, rectangular, indented, slit-like, and even double; what is more remarkable, however, than all, is, that these malformations are sometimes hereditary. Children are occasionally born without a pupil. This usually arises from the persistence of the pupillary membrane, which has been known to continue until the tenth, fifteenth, and even thirtieth year. The changes produced in the pupil by disease have been already noticed.

11. The first change occasioned in the *capsule* of the lens by inflammation, is a loss of transparency, arising from too great a fulness of its serous vessels. These vessels are arranged in the form of a wreath, composed of several distinct arches, situated about a fourth of a line from the pupillary margin of the iris. Running backwards from this wreath, in different directions, are numerous hair-like branches, which gradually lose themselves at the circumference of the lens, in the iris, and in the ciliary processes. From its excessive delicacy, this vascular arrangement can seldom be discerned without the aid of a magnifying-glass; and, occasionally, there is reason to believe that it is altogether wanting. Accompanying this injected state of the membrane is an effusion of lymph, which has always a tendency, when the disease involves the anterior hemisphere of the capsule, to produce adhesions between it and the iris. At other times, the fluid is poured out in the form of small flakes, which float about in the chambers of the eye, where they are either gradually absorbed, or become attached to the surrounding parts. Occasionally the lymph connects itself at each side with the edge of the pupil, and shoots forward like a thin, narrow bar, which, in cases of long standing, has been known to have a cartilaginous, and even an osseous consistence. In regard to the membrane itself, its texture is always remarkably altered, becoming thick, tough, and of a white, opaque, milky appearance. Similar changes occur when the disease attacks the posterior segment, with the addition of much greater vascularity.

The inflammation of this membrane generally observes a chronic course. It proceeds very slowly, and is attended with little or no pain. It is most common about the age of forty, and usually attacks subjects of a cachectic disposition, with light eyes. The iris, of a darker color than natural, is sluggish in its motions, and the pupil is contracted, irregular, and encircled by a black, narrow rim. When the disease has continued for a long time, the vessels of the capsule are apt to become permanently varicose. Pus sometimes forms; and cases occur in which the inclosed lens is completely dissolved.

Opacity of this structure forms a species of cataract, denominated *capsular*, a disease which is often congenital. As already hinted, it may affect either a part or the whole of the membrane; but, in the majority of instances, it is restricted to the anterior segment. The color of the cataract is very various. Sometimes it is of a dull milky appearance; sometimes white and glistening; sometimes mottled, grayish, yellowish, or brownish. Its texture also is very various, being at one time soft and pulpy, at another brittle and easily ruptured, at another tough and elastic, or of the thickness and consistence almost of the cornea. In advanced life, the capsule is sometimes ossified, either in part, or through its whole extent.

In the natural state, there is always found between the capsule and the lens a minute quantity of thin, pellucid fluid, called the *liquor of Morgagni*. This fluid occasionally becomes opaque, and thereby constitutes a species of cataract. It is also the seat, in some rare instances, of a species of threadworm, the *ocular filaria* of Nordmann.[1] In one of the cases narrated by this writer, the animal was three-quarters of a line long, extremely narrow, and of uniform thickness, like the most slender thread. It was spirally convoluted, and had a simple intestinal tube, with a mouth, a uterus, and a prominent anal aperture. In another patient, an old female, Dr. Nordmann found the eye occupied with microscopical entozoa, possessing distinct suckers, and appertaining to the monostomatic genus of Rudolphi. The individuals, which were eight in number, were situated in the upper strata of the crystalline lens, were one-tenth of a line in length, and moved sluggishly on being placed in tepid water. The substance of the lens was still soft, and retained a considerable degree of transparency.

12. It is doubtful whether the *crystalline lens* is susceptible of acute inflammation; but that it is often affected chronically is abundantly established by the changes which it undergoes in its color, shape, and consistence. These changes generally occur slowly, and, taken together, constitute what is termed lenticular cataract. Existing either singly, or, as is more frequently the case, in combination with an altered condition of the investing membrane, lenticular cataract has been observed at all ages, but is most common, by far, in young children and in old persons. Infants are often born with it, and in some cases it is hereditary. Wardrop knew a father, son, and grandfather affected with it; and examples of a similar nature are recorded by different authors. Janson saw a whole family, consisting of six members, blind from this disease. A similar case was mentioned to me by the late Professor Drake. Males are much oftener affected than females, owing chiefly to their greater liability to all kinds of exposure.

The disease generally proceeds slowly, so that vision is not destroyed for several years. Occasionally, however, the reverse obtains, the patient becoming blind in a very short time, as a few hours or days. The disease may go on simultaneously in both eyes, but generally it begins in one, and in time attacks the other. The starting-point of the opacity is usually the centre of the lens, from which it gradually extends towards its circumference.

The consistence of a lens in a state of opacity may be natural, augmented, or diminished. An increase of consistence is most common in old persons and in cases of long standing. After the sixtieth year, and occasionally even before that period, the cataract is frequently so hard that it cannot be divided by the needle; and cases are not wanting in which it is completely ossified. A natural consistence is of rare occurrence, and is seldom seen except in young subjects, or in persons in whom the disease forms with extraordinary rapidity. A diminution of consistence is most common in childhood, and is sometimes very considerable, the lens being reduced to a thin milky fluid, or to a substance resembling half-boiled glue, arrowroot, or soft curds.

---

[1] Mikrographische Beitrage zur Naturgeschichte der Wirbellosen Thiere: Erstes Heft, pp. 11-13.

The color of a cataract is extremely variable. In children the opacity is generally white, like milk; in older subjects, it is often of the hue of isinglass, a solution of starch, or a half-boiled egg; in aged persons, still darker, of a yellowish amber color, grayish, or brownish. A mottled appearance is not uncommon; and, in some cases, though this is rare, the lens presents a radiated arrangement, the opaque lines converging towards the centre of the affected organ. It is important to remark that a diseased lens is seldom of the same color in the eye that it is out of it.

A change of form is of rare occurrence, and cannot be regarded as a necessary consequence of opacity. The volume of the affected lens may be natural, increased, or diminished. An augmentation of size is seldom observed, and then chiefly in cases of soft cataract. Atrophy of the lens is very common in old people, and often takes place without any accompanying opacity.

13. The *vitreous humor*, when evacuated, is never reproduced. The changes which it undergoes from disease have not been much studied, and we know, therefore, very little about them. It is sometimes unusually thick or thin, increased or diminished in quantity, and more or less altered in color. The capsule itself, being of the same structure as the membrane of the aqueous humor, is liable to the same morbid states. These, however, have not been observed with sufficient accuracy to admit of description. The membrane has been found ossified.

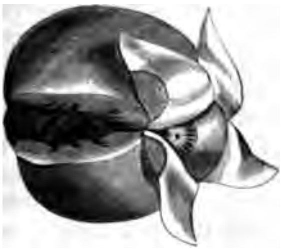
14. *Heterologous Products.*—We have thus taken the eye apart, as it were, and analyzed the diseases of its different structures. Considered as a whole, it is sometimes affected with atrophy and various malignant growths. Of these, the most frequent are encephaloid and melanosis.

*Encephaloid*, although most frequent in children, is by no means peculiar to them. I have noticed it repeatedly in adults; and, in one case, in a lady, forty-two years of age. In this case, as in many others, the disease was evidently excited by external violence. For awhile, it grew very slowly; but, on reaching the sclerotica, it advanced with great rapidity, so as to acquire, in a few months, a large size. In October, 1837, when the patient was admitted into the Cincinnati Hospital, under the care of the late Professor Drake, the eye was of a cylindrical shape, ulcerated, of a dark livid color, and the seat of repeated hemorrhages. It projected at least an inch and a half beyond the lids, but could still be moved by its own muscles, and did not appear to be attached to the socket. Her general health was infirm. In this condition the organ was removed, when I observed the following appearances: the entire mass, after being divested of the muscles and cellulo-adipose tissues of the orbit, all of which were quite healthy, was nearly three inches in length by five and a quarter in circumference, its weight being a little upwards of two ounces. The eye itself was of the ordinary form and volume, but was considerably thrown out of its position by the morbid growth, which was of an irregularly oval shape, and sprung from the inner side of the sclerotica, near its junction with the cornea. This connection, however, was rather apparent than real; for, on tracing the heterologous mass, it became evident that it originated in the retina, which had itself almost disappeared. The anterior surface was closely invested by the conjunctiva, which had a rough, fleecy aspect, from the morbid enlargement of its villosities: about its centre was an incrusted ulcer, three-fourths of an inch in diameter, around which the parts were somewhat knobby, and of a bluish livid color. On cutting through this portion of the tumor, it was found to consist essentially of vessels, some of which had been opened by the erosive process, and formed the source of the frequent hemorrhages with which the patient had been latterly affected. Posteriorly the mass was of a much lighter complexion, as well as more soft, and exhibited that peculiar tuberoid arrangement so characteristic of encephaloid.

The cornea, although still transparent, was considerably diminished in size, and adhered firmly to the iris. The sclerotica was of the natural thickness, extensively attached to the choroid, and of a yellowish buff color. The choroid itself was of a speckled, brownish appearance; at some points, it was completely disorganized; and, at one part, nearly opposite the morbid growth, there was a thin, black layer of blood beneath it. The retina, as before stated, was almost entirely destroyed; and, in place of the vitreous humor, there was a dense, solid, whitish mass, evidently the result of an effusion of fibrin. The anterior chamber of the eye was obliterated, and the iris transformed into a substance resembling fibro-cartilage. The optic nerve, near its entrance into the sclerotica, was slightly enlarged, bulbous, and pervaded by encephaloid matter. The appearances of the eye are pretty well shown in the annexed sketch (Fig. 129), taken from the actual specimen.

In this case the retina was probably the primary seat of the disease, as in fact, it nearly always is. The rapidity with which encephaloid of the eye runs its course varies from a few months to a year and a half; when extirpated it almost invariably returns.

Fig. 129.



Encephaloid of the eye. From a preparation in my cabinet.

*Melanosis* of the eye generally originates deep in the organ; and always involves the retina, if indeed it do not commence in it. The optic nerve is frequently implicated, which is another proof that the heterologous growth may arise in this manner. In a case recorded by Mr. Allan Burns, the cord within the cranium was as thick as the little finger and as black as ink. The disease usually coexists with the same affection in other parts of the body, and has hitherto been noticed principally in persons above the middle age. Like encephaloid, it gradually involves all the textures of the eyeball, finally protrudes, and terminates in destructive ulceration.

# CHAPTER XIII.

## EAR.

**Malformations of the External Ear.—Polypous Growths—Lesions of the Tympanum.—Bones of the Ear.—Eustachian Tube.—The Labyrinth and Vestibule.—Diseases of the Auditory Nerve.**

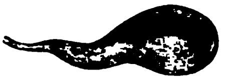
1. THE *external* ear, embracing the auricle and auditory tube, affords a subject for pathological consideration, chiefly on account of congenital malformation and polypous growths. The former of these is usually comprehended under the title of imperforation of the ear. It is caused by the development of a membrane, varying in extent and thickness, simple, or complex, and accompanied with deficiency of the auricle and auditory canal. The commonest form in which it is presented is that of a single skin-like membrane, with a central indentation, corresponding with the entrance of the natural orifice; the depth at which the septum is situated is from half a line to the third of an inch; occasionally, indeed, it lies almost in contact with the tympanum. In the more complicated cases, there is not only such a structure as that here mentioned, but great malformation of the outer ear generally.

Sometimes the external ear is entirely wanting. The malformation is usually confined to one side, and is almost constantly connected with defective organization of the auditory passage. The hearing is not always lost when this state of parts exists. Another deviation from the normal standard is the congenital absence of the lobule of the ear, or its adhesion to the side of the head. An anomaly of an opposite character is the enormous development of these parts.

The auditory canal, as before stated, is sometimes imperforate; at other times it is very much diminished, and occasionally it is closed up by a dense, gristly substance, possessing all the properties of fibrocartilage. Contraction of the canal may depend upon malformation of the temporal bone, or upon thickening of the soft parts, particularly the cuticle. Deviations in the direction of this passage are now and then observed; but this is rare, and seldom exists singly. Sometimes its orifice is a mere slit instead of a round opening, and instances occur in which it is seriously encroached upon by the tragus, antitragus, and antihelix.

The lining membrane of the auditory tube is sometimes the seat of *polypes.* Soft and spongy in their consistence, they are of a pale reddish color, possess little sensibility, are very prone to bleed when injured, and seem to consist principally of a congeries of bloodvessels, connected by loose, cellular tissue, and inclosed by a thin, delicate epithelium. They are generally of a conical shape, their attachment being by a narrow pedicle, whilst the body fills up the auditory passage, and sometimes projects a considerable distance beyond its orifice. Occasionally there are several such excrescences; and they have been known to be of the form, color, and consistence of a mulberry. Their progress is slow, and they may exist for a long time without destroying the functions of the ear. When connected, as they sometimes are, with the tympanum, they are apt to produce permanent deafness. The exposed parts are commonly indurated, and of a whitish color, from the influence of the atmosphere. These growths of the ear are always attended with an increase of the natural secretion, which is generally very fetid and acrid.

Fig. 130.



Gelatinoid polype of the ear. From a preparation in my cabinet.

The adjoining sketch (Fig. 130) represents a beautiful specimen of the gelatinoid polype, which I removed some time ago from the right ear of a young man of twenty-six. It completely filled the auditory tube.

Do *wounds* of the tympanum ever cicatrize? Daily observation has long since answered this question affirmatively. Nor are there experiments wanting to illustrate the subject. Valsalva repeatedly perforated, and even lacerated, this structure in dogs, which, after some time, he killed. In every one, the wounds were perfectly closed and cicatrized. Similar experiments, performed by others, were followed by similar results. Indeed, so fully are surgeons aware of this occurrence that particular instruments have been devised for the purpose of preventing it. The period required for this reunion in the human subject varies from six to eighteen days, according to the size and shape of the opening, and the state of the membrane at the time of the operation.

Acute *tympanitis* is by no means unusual; and the rapidity of its course, as well as its mode of termination, is extremely variable. Generally only one ear suffers at a time, though it often happens that both are affected simultaneously. The anatomical characters are increased opacity and thickening, with perverted secretion. In mild cases, the redness is usually very slight, only a few straggling vessels being seen; but when the inflammation is intense, the affected part is of a scarlet hue, and the capillaries are so numerous as to exhibit the appearance of a beautiful network. The normal transparency also is destroyed, and the parts look swollen and protuberant. Although lymph is seldom found upon the free surfaces of the membrane, yet in very severe cases it is not uncommon for this substance to be effused into its interlamellar structure. The ceruminous secretion is frequently suppressed, but the auricle and auditory tube remain unaltered.

This disease, which may affect either a part or the whole of the membrane, sometimes terminates in *suppuration*. The matter is rarely of a healthy character; on the contrary, it is usually muco-purulent, thin, fetid, and so acrid as to erode the structures with which it comes in contact. Blood is occasionally blended with it, the result, probably, in most instances, of exhalation. If the suppurative process be allowed to pursue its course, ulceration is superadded, which often continues until the membrane is seriously injured. The part of the membrane most liable to be thus affected is that immediately around the insertion of the handle of the malleus. The number of ulcers is always small: they are, for the most part, of an oval shape, and they vary in size between that of a pin-head and a split pea; in many instances they embrace the whole thickness of the affected part, leading to perforation and discharge of the bones of the ear. Ulcers in this situation sometimes cicatrize.

In *chronic* inflammation, although the vascularity is usually much less than in the acute form, the membrane exhibits every shade of color, from a light pink to a deep red. Striking alterations in the texture of the affected part are also observed. It is opaque, uneven, and thickened, so that the concavity of the membrane is effaced, and the insertion of the malleus can no longer be recognized, even in strong light. Minute granulations are often seen upon the inflamed surface, of variable consistence, and of a pale ash, greenish or reddish color: they are seldom larger than a clover-seed, and are generally excessively sensitive, as well as vascular, giving rise to considerable pain, and bleeding on the slightest touch. Small openings are frequently observed; added to which there is always a muco-purulent secretion, which is often discharged in great quantities, both externally and along the Eustachian tube. The matter is usually excessively offensive, particularly in scrofulous subjects, and of a greenish yellow color. In other cases, it is thin and glairy, like the white of eggs, and exhales a disagreeable ammoniacal odor. When the inflammation continues very long, the tympanum, if not wholly destroyed, not only becomes opaque and thickened, but acquires a dense, fibrous consistence.

In severe cases of this disease, it is not uncommon for the cellular tissue and periosteum of the middle ear to become involved. A destruction of the tympanum, together with a discharge of the small bones, is the usual consequence of this state. In addition to this, there is generally extensive suppuration; the middle ear, the labyrinth, and the mastoid cells are filled with acrid pus; the petrous portion of the temporal bone is carious; the adjacent part of the dura mater is thickened, discolored, and partially detached; and the brain is softened and otherwise disordered.

Pus, chalky concretions, and tubercular matter are sometimes found in the *tympanic* cavity; and Morgagni observed a case in which it was intersected by delicate membranous bands, the result, probably, of former inflammation. Itard saw it filled with thick, yellow lymph; and, in one instance, he noticed a thin, watery fluid inclosed in distinct cells. Rosenthal witnessed similar appearances in the tympanum of a deaf mute.

The proper *bones* of the ear may be wanting as a congenital defect, or as the result of ulcerative action of the tympanum. It is seldom that they are all absent.

2. The lesions of the *Eustachian* tube may be thus stated: 1, congenital imperforation; 2, acute and chronic inflammation, with indu-

ration and thickening of the lining membrane; 3, partial stricture; 4, the presence of chalky matter; 5, mucous obstructions. Similar lesions occur in the mastoid cells.

3. Of the diseases of the *labyrinth* very little is known; it is certain, however, that they are infrequent, and that their anatomical characters have hitherto been very little studied.

Nature may leave the structure of the labyrinth imperfect, or it may, so to speak, wholly neglect its organization. In a case mentioned by Saissy, although the ear was well formed, the essential part of the auditory apparatus was entirely absent, there being no trace whatever of the vestibule, cochlea, or semicircular canals. The small bones, however, were present, and the cavity of the tympanum was filled with a mucilaginous fluid. The Eustachian tube exhibited nothing unusual. The labyrinth is sometimes imperfectly ossified, exposing thereby a portion of its membranous structure; and cases are observed, though they are very rare, in which it is composed of a single cavity, having no communication with the tympanum. Malformations of this kind are analogous to what naturally occurs in the organ of hearing in crustaceous animals.

The *vestibule*, as well as the rest of the labyrinth, is occasionally filled with a substance resembling cheese. Haighton and Cline each met with an interesting case of this kind, attended with congenital deafness. Itard found the vestibule occupied with calcareous matter. Duverney often saw the labyrinth filled with thick, purulent fluid. This appearance is most common in young children, and in nearly every case is connected with disease of the cavity of the tympanum.

Another malformation of this portion of the auditory apparatus is that of the round and oval apertures. These openings are not only unusually small in some instances, but even entirely wanting. The membranes closing them may also be diseased. Long-continued irritation has a tendency to render them thick, hard, and dry; and cases occur in which they are completely ossified. It has been seen that the Cotunnian liquor is liable to degenerate into substances not naturally contained in the internal ear.

Of the diseases of the *auditory nerve* we are totally ignorant. That it is liable to be variously affected there can be no doubt; and that deafness, partial or complete, may be thus induced appears equally certain. The nerve is sometimes unnaturally small, soft, or hard.

# CHAPTER XIV.

## THYMUS GLAND.

**Weight and Size.—Development and Decay.—Hypertrophy.—Thymic Asthma.—Inflammation.—Ulceration.—Scirrhus.—Tubercular Deposits.—Ossification.—Steatomatous degeneration.**

THE weight of the thymus at birth varies from a drachm and a half to three drachms and a half, or even four drachms, according to the size of the fœtus, and the quantity of sero-albuminous fluid contained in the cavity of the organ. The gland sometimes consists of two distinct lobes, connected together by a narrow isthmus; at other times it is extremely small, weighing, perhaps, scarcely a drachm, and in a few instances it has been found entirely wanting, as a congenital defect, in acephalous or anencephalous monsters.

The size of this organ is not less variable than its weight. The following are the dimensions of eleven thymus glands, as furnished by Dr. Roberts, of New York.

| Number. | Length. | Breadth. | Thickness. |
|---|---|---|---|
| 1 | 1 inch | 1 inch | |
| 2 | $1\frac{8}{10}$ | $1\frac{8}{10}$ | 5 lines. |
| 3 | $2\frac{2}{20}$ | 2 | |
| 4 | $2\frac{4}{10}$ | $1\frac{8}{10}$ | |
| 5 | 2 | $2\frac{1}{2}$ | |
| 6 | $2\frac{1}{5}$ | $2\frac{1}{2}$ | $\frac{7}{10}$ |
| 7 | $2\frac{1}{2}$ | $1\frac{3}{10}$ | |
| 8 | $2\frac{1}{2}$ | $1\frac{1}{4}$ | |
| 9 | $3\frac{1}{4}$ | $2\frac{1}{4}$ | |
| 10 | $3\frac{3}{16}$ | $1\frac{1}{4}$ | |
| 11 | $2\frac{3}{8}$ | $1\frac{3}{4}$ | |

The thymus gland is subject to very few diseases; the principal, requiring consideration, are atrophy and hypertrophy, together with the tubercular and carcinomatous degeneration. The organ is very little disposed to common inflammation; and hence abscesses are of very infrequent occurrence.

The development and *decay* of this organ have received much attention from anatomists. It becomes visible during the third month of gestation, and continues to grow until the end of the second year. Between this period and the commencement of the second dentition, the gland remains nearly stationary in its size, undergoing, however, certain changes in its structure and consistence, by which, whatever be their nature, it is probably rendered unfit for the further performance of its functions. It is only after the evolution of the permanent teeth that the organ begins to experience any decided decrease: it now rapidly diminishes in volume; its vessels shrink; its cells are obliterated; and, as the juice by which it is moistened dries up, its substance becomes hard and shrivelled. At a still later period, the gland loses its granular structure, and no longer exhibits any traces of its lobular arrangement, a soft, dingy, cellular tissue being all that is left, and this, in time, is wholly absorbed. The precise age at which the last traces disappear does not seem to be accurately ascertained; many highly respectable writers fixing it at the twelfth year, while others maintain that it is not completely absorbed until thirty. Caldani and Sir Astley Cooper, indeed, assert that it never entirely disappears, but that vestiges may always be found, whatever may be the age of the individual. My own dissections lead me to the conclusion that this organ varies very greatly, in respect to its disappearance, in different persons, being atrophied very early in some, and in others not until very late. In the generality of cases, it is completely effaced between the twelfth and fifteenth years. Although the changes here described are altogether of a physiological character, there is reason to believe that they are occasionally expedited by accidental circumstances, as the pressure of an enlarged heart, a diseased lung, or an aneurismal state of the arteries at the base of the neck.

*Hypertrophy* is rather a common affection of this gland. The organ is enlarged in every direction, but most of all in thickness. The weight usually varies from six to eight drachms. In some instances, it has amounted to nearly two ounces. When very bulky, the organ compresses the lungs and trachea, inducing that peculiar train of symptoms known as thymic asthma. Occasionally, the enlargement is so great as to conceal the heart, and obscure its pulsations. Morbid adhesions are sometimes formed between the gland and the surrounding structures; and the large veins at the base of the neck are often so much obstructed as to prevent the ready return of the blood from the brain to the heart.

The substance of the gland may be in a normal state, or variously altered in color and consistence. Occasionally, it is pale, soft, and pulpy. More commonly it is preternaturally red, and of a dense, fleshy consistence, with numerous vessels running over its surface, and penetrating its interior. On cutting into it, a dirty milk-like fluid sometimes exudes from it.

Inordinate development of this gland is supposed by Kopp and others to be the cause of thymic asthma. The disease generally comes on between the fourth and tenth months, lasting from three to eight weeks. It is believed to be most common in scrofulous subjects; males are more liable to it than females; and it appears to be often associated with an open state of the oval foramen.

The thymus gland is doubtless subject to common inflammation, both acute and chronic; but the disease has been so seldom observed that no one has yet attempted to point out its anatomical characters. Many cases are on record in which purulent fluid was found in its interior; but there is reason to believe that, in a great majority of them, if not in all, it was the result of the softening of tubercular matter, and not of ordinary suppuration. What countenances this opinion is the fact that the pus usually coexists with tubercular disease of other parts of the body, particularly the lungs, spleen, and lymphatic ganglions, and that it is almost always of a curdy or caseous nature, similar to that of a lumbar abscess, a scrofulous joint, or a pulmonary excavation. Ulceration of this gland has been observed in a few rare cases.

This organ is said to be occasionally the seat of *scirrhus*, but this is questionable. Of encephaloid, melanosis, and colloid, as occurring here, we have no knowledge.

*Tubercles* of the thymus have been noticed by a considerable number of pathologists. A very interesting case of the kind fell under my observation many years ago, in a phthisical child, fifteen months old. The tubercles were of large size, and in a state of partial softening. The glandular structure immediately around them was unusually hard, and of a deep red color, from the great distension of its vessels. Tubercles, some of them in a state of suppuration, also existed in immense numbers in the lungs and spleen. All the other viscera were sound.

The thymus has been found partially ossified, and cases have occurred where it was enlarged and occupied by calcareous concretions. Writers also speak of the steatomatous degeneration of this organ, but of this there are no well-authenticated examples on record.

# CHAPTER XV.

## THYROID GLAND.

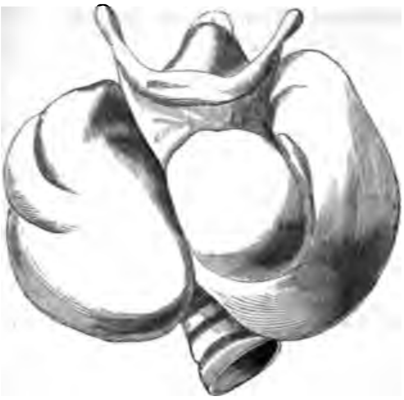
**Acute Inflammation.—Suppuration.—Goitrous Enlargement.—Sanguineous Effusions.—Atrophy.—Tubercular Deposits.—Scirrhus.**

THERE are few organs more exempt from disease than the thyroid gland. The principal affection to which it is liable is bronchocele, goitre, or chronic enlargement; it is likewise susceptible of acute inflammation, suppuration, carcinoma, and several kinds of degeneration. Gangrene rarely, if ever, occurs.

1. *Acute inflammation* of the thyroid gland may be ranked among the rarest affections. Existing occasionally as an idiopathic disease, it is generally caused by external violence, local irritants, or lesion of some contiguous structure, as the larynx, trachea, or œsophagus. The anatomical characters are very similar to those which take place in inflammation of the other organs. The gland is soft and succulent, considerably augmented in bulk, and of a dark purple hue; all its vessels being abundantly loaded with blood. Sometimes its substance

is remarkably tender, yielding under the slightest pressure of the finger; in a few rare instances it is infiltrated with blood, sanies, or pus. Matter is seldom found as a consequence of acute inflammation; still more rarely is it deposited in the form of an abscess. Of this, however, I have seen a most interesting example, in a man forty-four years of age, who died of pneumonitis after an illness of three weeks. On inspection, I found the whole gland, with the exception of a small portion of its inferior extremity, converted into a thin, delicate sac, containing nearly three ounces of thick, cream-colored pus. The thyroid cartilage was completely denuded, and the matter had burrowed upwards, underneath the hyoid bone on the left side, as far as the root of the tongue. The most extraordinary circumstance in this case was, that the patient had never experienced the slightest uneasiness in this part during his indisposition, and it was only by accident that the lesion was discovered on the examination. More frequently the suppuration follows on chronic inflammation. The matter is tardily secreted, and the integuments become gradually distended, until they form a large pouch, which hangs sometimes over the sternum. From the effect of the muscles and cervical aponeurosis, it is generally slow in making its way to the surface. In some instances, it bursts into the trachea, and destroys the patient by suffocation.

Fig. 131.



Goitre. From a preparation in Professor Mütter's collection.

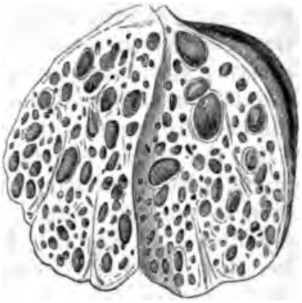
2. Chronic enlargement of the thyroid gland, constituting what is called *bronchocele*, *hypertrophy*, or *goître* (Fig. 131), occurs at all periods of life, from infancy to old age, and is principally observed in the female sex. It is most apt to appear within the first twelve years after birth; and instances are not wanting, though they are rare, where it is congenital. The disease has been noticed in the horse, cow, sheep, dog, and other inferior animals.

There are certain localities in different quarters of the globe in which this disease is much more common than in others, for what reason is not known. In the United States, it is mostly observed in the mountainous districts of Pennsylvania, Virginia, New York, New Hampshire, and Vermont; in England, it is very common in Derbyshire, Norfolk, and Surrey; and, in the valleys of the Alps, Apennines, and Pyrenees, it not unfrequently prevails endemically, almost all the native inhabitants being more or less affected with it. The enlargement is often attended with a stunted development of the body; and, in certain parts of Switzerland, Savoy, Lombardy, and the Tyrol, it is apt to occur in combination with cretinism; a state characterized by great deformity of the head, and entire absence of intellect.

Hypertrophy usually begins in the form of a small tumor, on one or both sides of the trachea, which, gradually enlarging, at length occupies the whole anterior part of the neck, from the chin to the top of the breast-bone. In some instances, the swelling is of frightful magnitude, extending upwards as far as the ears, and downwards a considerable distance over the chest. In the early stage of the disease, the substance of the tumor is not materially altered; it is unnaturally vascular, slightly indurated, and still elastic; as the enlargement progresses, however, it becomes more and more firm, until ultimately it acquires the density of a hepatized lung, or even of fibro-cartilage. The hypertrophy, although it usually begins simultaneously in both lobes, seldom proceeds equally, and occasionally it is seated chiefly in the isthmus of the organ, the remainder being little affected.

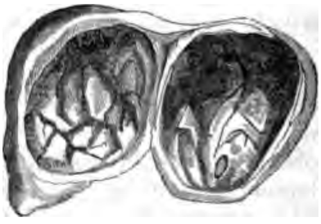
The internal substance of the tumor is liable to considerable variety, depending upon its age and progress. When of moderate standing, it is generally of a soft, gelatinous consistence, emitting, on pressure, a ropy, glutinous fluid. In more ancient cases it is of a pale cinnamon tint, hard to the feel, and interspersed with numerous cysts, generally not larger than a pea, containing a serous, glairy, or melicerous substance, and occasionally pus, fibrin, or even pure blood. These cysts are merely enlarged cells, which are dispersed through the organ in the natural state. Fig. 132 exhibits these cavities hypertrophied from disease, and occupied by a white, semi-concrete substance, similar to coagulated lymph. Calcareous concretions are sometimes found, either alone, or in union with cartilaginous and osseous productions. In a small goitrous tumor, which I removed from a man fifty years of age, and which is now in my private collection, there are several small steatomatous masses, with a circular nodule of bone, about six lines in diameter. It is of a yellowish color, very compact in texture, and surrounded by a thin, imperfect capsule. Occasionally the whole organ is transformed into an osseous cyst, filled with various kinds of matter, especially the jelly-like, the suety, and the meliceric. I have a specimen of this kind in my cabinet; one of the lobes has almost entirely disappeared, whilst the other is converted into a firm, solid capsule, as hard as bone, though scarcely a line in thickness. On sawing through this osseous tumor, which does not exceed the volume of a hen's egg,

Fig. 132.



Cellular structure of a goitrous thyroid gland From a preparation in my collection.

Fig. 133.



Ossified thyroid gland. From a specimen in my cabinet.

I found it filled with a white, curdy, friable substance, not unlike semi-concrete cheese. The annexed sketch (Fig. 132), represents a section of it.

The thyroid arteries are commonly much enlarged; and, in some cases, the goitrous swelling seems to consist almost wholly of a congeries of varicose veins. Under such circumstances it is by no means unusual to meet with considerable *sanguineous effusions*, in various stages, so to speak, of maturation, some being quite fluid, others semi-concrete, and some, again, of a dense, firm consistence, like old apoplectic depôts of the brain. The blood is commonly poured into the enlarged vesicles, but occasionally it finds its way into the connecting cellular substance, which is, at the same time, more or less lacerated. In some instances, it may be traced directly to a ruptured vessel.

In the early stage of the disease, the skin over the affected gland is perfectly natural, both as regards its color and mobility; by and by, however, as the hypertrophy increases, it becomes dark, dense, vascular, and irregularly adherent. The enlargement is usually very slow and gradual, years often elapsing before it attains much bulk. Occasionally the gland, after having become partially hypertrophied, remains stationary for a while, and then goes on increasing; or suppuration sets in, and the substance of the organ is absorbed; nature thus effecting a sort of spontaneous extirpation.

Of the remote causes of goitre, nothing satisfactory is known. By many it has been attributed to the use of impure water, to innutritious diet, to the repulsion of cutaneous diseases, and a variety of similar circumstances equally hypothetical, and, for aught we know, unfounded. The proximate cause appears to be inflammatory irritation of the thyroid tissues, pursuing a slow, chronic march. That this is the fact is at once indicated by the morbid alterations which the organ experiences during the progress of the enlargement, and which can only be explained on the ground here assumed.

3. The thyroid gland is sometimes partially *atrophied*. I have repeatedly found it reduced to a soft, spongy, dirty-looking mass, less than one-third the ordinary bulk. The wasting, which is more common in men than in women, is observed chiefly in advanced life. The vessels supplying the atrophied gland are usually very much diminished in volume, many of the smaller branches appearing to be wholly obliterated. The nerves are also abnormally delicate.

4. *Tubercles* are among the rarest productions of the thyroid gland; and the same remark is true respecting carcinoma, whether of the encephaloid or scirrhous variety. Of colloid, as occurring in this body, no example is on record. Melanosis, on the contrary, is occasionally observed, and is probably more common than any other of the heterologous formations. In a case which fell under my observation in 1855, in a man aged fifty-nine, the black matter formed a large nodule on each lateral lobe, of a dense, firm consistence, distinctly visible beneath the skin. Similar deposits existed in various other organs.

# CHAPTER XVI.

## RESPIRATORY APPARATUS.

**I. *Lesions of the Air-Passages.*—Inflammation of the Larynx.—Membranous Croup.—Œdema of the glottis.—Ossification of the Laryngeal Cartilages.—Polypous Growths.—Warty Excrescences.—Tubercles and Hydatids.—Tracheitis.—Stricture.—Dilatation.—Inflammation of the Bronchiæ. Dilatation.—Contraction.—Flattening.—II. *Lesions of the Lungs.* —Acute Inflammation. — Hepatization.—Abscess. — Gangrene. — Chronic Pneumonitis. — Carnification.—Œdema.—Emphysema.—Apoplexy. — Encephaloid Disease. — Melanosis.— Serous Cysts.—Hydatids.—Calcarerous Concretions.—Hypertrophy.—Atrophy.—Tubercular Phthisis.—III. *Lesions of the Pleura.*—Acute Inflammation.—Formation of Matter.—Gangrene.—Chronic Pleuritis.—Ossification.—Accumulation of Gas.—Ulceration.—Tubercular Deposits.**

## SECTION I.

### AIR-PASSAGES.

1. *Larynx.*—The larynx is liable to inflammation, œdema, abscess, ulceration, ossification of its cartilages, and polypous growths.

Preternatural vascularity, and redness of the lining membrane, either diffused or in patches, with tumefaction of the mucous follicles and the secretion of a clear limpid fluid, constitute the anatomical characters of *acute laryngitis* in its earlier stages. By degrees, the redness increases in intensity, and extends, on the one hand, down into the trachea, and, on the other, up into the fauces, affecting, in some instances, the tonsils, soft palate, and even the root of the tongue. The epiglottis is variously affected. In some cases it is thickened, infiltrated, and so erect as not to cover the mouth of the larynx; in others, it is highly vascular, dotted with lymph, and studded with enlarged follicles. Within the larynx itself, the tumefaction is seldom very conspicuous, except sometimes in the ventricles; and it almost always terminates at the junction of the trachea, although, as was before mentioned, the redness often extends beyond it. In the progress of the disease, the natural secretion becomes much altered; it is no longer thin, sparse, and watery, but thick, tough, abundant, and of a yellowish tinge.

Acute laryngitis usually runs its course in from three to five days. It almost always occurs in the prime of life, between the years of puberty and forty-five, in which respect it differs remarkably from croup, which, as will be presently seen, is most common in young children.

It has been already intimated that one of the effects of acute larynration and thickening of the lining membrane; 3, partial stricture; 4, the presence of chalky matter; 5, mucous obstructions. Similar lesions occur in the mastoid cells.

3. Of the diseases of the *labyrinth* very little is known; it is certain, however, that they are infrequent, and that their anatomical characters have hitherto been very little studied.

Nature may leave the structure of the labyrinth imperfect, or it may, so to speak, wholly neglect its organization. In a case mentioned by Saissy, although the ear was well formed, the essential part of the auditory apparatus was entirely absent, there being no trace whatever of the vestibule, cochlea, or semicircular canals. The small bones, however, were present, and the cavity of the tympanum was filled with a mucilaginous fluid. The Eustachian tube exhibited nothing unusual. The labyrinth is sometimes imperfectly ossified, exposing thereby a portion of its membranous structure; and cases are observed, though they are very rare, in which it is composed of a single cavity, having no communication with the tympanum. Malformations of this kind are analogous to what naturally occurs in the organ of hearing in crustaceous animals.

The *vestibule*, as well as the rest of the labyrinth, is occasionally filled with a substance resembling cheese. Haighton and Cline each met with an interesting case of this kind, attended with congenital deafness. Itard found the vestibule occupied with calcareous matter. Duverney often saw the labyrinth filled with thick, purulent fluid. This appearance is most common in young children, and in nearly every case is connected with disease of the cavity of the tympanum.

Another malformation of this portion of the auditory apparatus is that of the round and oval apertures. These openings are not only unusually small in some instances, but even entirely wanting. The membranes closing them may also be diseased. Long-continued irritation has a tendency to render them thick, hard, and dry; and cases occur in which they are completely ossified. It has been seen that the Cotunnian liquor is liable to degenerate into substances not naturally contained in the internal ear.

Of the diseases of the *auditory nerve* we are totally ignorant. That it is liable to be variously affected there can be no doubt; and that deafness, partial or complete, may be thus induced appears equally certain. The nerve is sometimes unnaturally small, soft, or hard.

# CHAPTER XIV.

## THYMUS GLAND.

**Weight and Size.—Development and Decay.—Hypertrophy.—Thymic Asthma.—Inflammation.—Ulceration.—Scirrhus.—Tubercular Deposits.—Ossification.—Steatomatous degeneration.**

THE weight of the thymus at birth varies from a drachm and a half to three drachms and a half, or even four drachms, according to the size of the fœtus, and the quantity of sero-albuminous fluid contained in the cavity of the organ. The gland sometimes consists of two distinct lobes, connected together by a narrow isthmus; at other times it is extremely small, weighing, perhaps, scarcely a drachm, and in a few instances it has been found entirely wanting, as a congenital defect, in acephalous or anencephalous monsters.

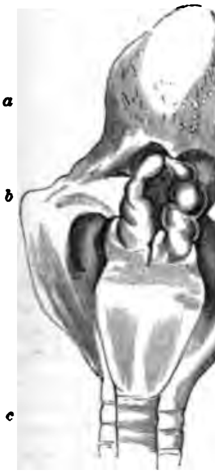
The size of this organ is not less variable than its weight. The following are the dimensions of eleven thymus glands, as furnished by Dr. Roberts, of New York.

| Number. | Length. | Breadth. | Thickness. |
|---|---|---|---|
| 1 | 1 inch | 1 inch | |
| 2 | $1\frac{8}{10}$ | $1\frac{8}{10}$ | 5 lines. |
| 3 | $2\frac{2}{20}$ | 2 | |
| 4 | $2\frac{4}{10}$ | $1\frac{8}{10}$ | |
| 5 | 2 | $2\frac{1}{2}$ | |
| 6 | $2\frac{1}{5}$ | $2\frac{1}{2}$ | $\frac{7}{10}$ |
| 7 | $2\frac{1}{2}$ | $1\frac{3}{10}$ | |
| 8 | $2\frac{1}{2}$ | $1\frac{1}{4}$ | |
| 9 | $3\frac{1}{4}$ | $2\frac{1}{4}$ | |
| 10 | $3\frac{3}{10}$ | $1\frac{1}{4}$ | |
| 11 | $2\frac{3}{8}$ | $1\frac{3}{4}$ | |

The thymus gland is subject to very few diseases; the principal, requiring consideration, are atrophy and hypertrophy, together with the tubercular and carcinomatous degeneration. The organ is very little disposed to common inflammation; and hence abscesses are of very infrequent occurrence.

The development and *decay* of this organ have received much attention from anatomists. It becomes visible during the third month of gestation, and continues to grow until the end of the second year. Between this period and the commencement of the second dentition, the gland remains nearly stationary in its size, undergoing, however, certain changes in its structure and consistence, by which, whatever be their nature, it is probably rendered unfit for the further performance of its functions. It is only after the evolugitis is an effusion of serum into the submucous cellular tissue. The infiltration, which is occasionally very great, is always most abundant around the edges of the glottis, which are frequently elevated into white, glossy, pendulous bags, resembling the gelatinous effusion which we sometimes see under the epidermis, after the application of a blister. This pathological state constitutes what is named *œdema of the glottis* (Fig. 134), an affection which is much more common in adults, after the age of thirty-five, than in early life. Its progress is usually very rapid, and its termination almost uniformly fatal, death being preceded by great anguish, and symptoms of suffocation. The difficulty of breathing, in this affection, results not so much from the absolute constriction of the chink of the larynx, as from the manner in which the tumid and infiltrated lips of the glottis are drawn in by the air, as it rushes from the mouth into the lungs.

Fig. 134.

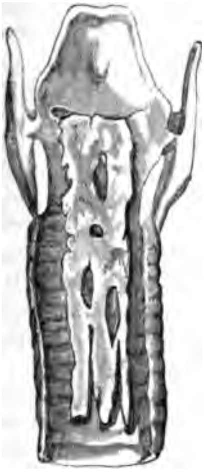


Œdema of the glottis. *a*. Tongue; *b*. Mouth of the larynx; *c*. Trachea. From a specimen in my cabinet.

*Suppuration* of the larynx is sufficiently common, but it is rare that we meet with abscesses. Their ordinary site is the ventricle of Morgagni, between the mucous membrane and muscles, or between this organ and the pharynx.

In other cases, together with the inflamed condition of the mucous lining, there is an exudation of *lymph*, either in dots, in patches, or in the form of a continuous lamella, as in Fig. 135, from a preparation in my cabinet. In simple laryngitis, this deposit is extremely rare; but, in that variety of the disease which is known by the name of croup, nothing is more common. In this affection, which differs further from ordinary inflammation by its being almost exclusively confined to infancy and childhood, the effusion is often very rapid, and moulds itself accurately to the shape of the organ, to the walls of which it sometimes adheres with considerable pertinacity. Athough it is occasionally limited to the larynx, yet the membrane usually passes into the trachea and bronchiæ, becoming gradually softer and more delicate, until finally, in the binary and ternary divisions of these tubes, it appears like a thin, mucous film. It sometimes extends upwards over the fauces into the mouth, and even into the nasal cavities.

Fig. 135.



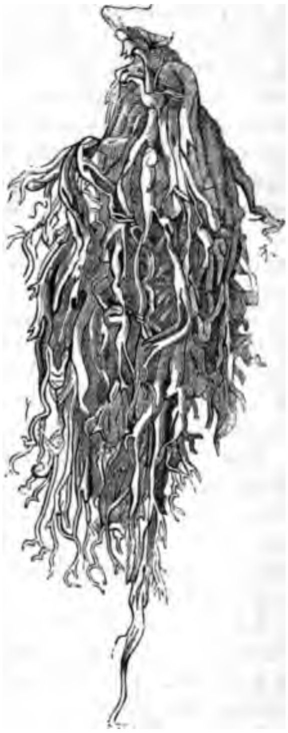
False membrane of croup. From a specimen in my cabinet.

In 120 cases examined by Houssenot, the false membrane was limited to the larynx and trachea in 78, while in 42, or one-third, it extended to the larger bronchiæ. Fig. 136 represents a portion of plastic lymph expelled from the lungs; it has a ramiform appearance, and must have reached into the smaller bronchial tubes, which, however, is infrequent.

Varying in thickness, in different cases, the membrane seldom exceeds the fourth of a line, though in some instances it is much greater. It is of a light grayish color, is composed chiefly of albumen and fibrin, and is generally much stronger, more tenacious, and more firmly adherent in the larynx than in the trachea and bronchial tubes; in the latter, indeed, it is often loose or even floating. The mucous coat beneath this lining is usually highly injected, inflamed, and unnaturally rough, from the projection of its mucous follicles. In slight cases, the color is of a light red, and occurs in patches, streaks, or points; in the more severe it is scarlet, brownish, or purple, and uniformly diffused.

To the presence of this plastic production, together with the tumefaction of the lining membrane of the trachea and bronchiæ, which so often accompanies the disease, is to be imputed, in great measure, the impediment to the respiration in croup. Sometimes portions of it are detached, and, by sticking in the air passages, cause suffocation. In other instances, it is coughed up, either piecemeal, or in the form of a dense, inspissated cylinder, and the patient recovers. The organization of this membrane is admitted rather from analogy than from any positive observation. The occurrence, if possible, must be extremely rare.

Fig. 136.



False membrane of the bronchial tubes.

Membranous croup, as already stated, is essentially a disease of early life. It is most frequent from the second to the tenth year, and seldom, if ever, takes place in a pure uncomplicated form, after the period of puberty. It sometimes occurs within the first few days after birth.

It is worthy of remark that this disease is more common in male than in female children, owing mainly, perhaps, to the circumstance, that the former are more exposed than the latter to its various exciting causes, such as cold and damp. Of 252 cases, treated by Gœlis from 1797 to 1808, 144 were boys, and 180 girls. Jurine met with 119 cases of this disease, of which 72 belonged to the male and 47 to the female sex. Of the cases treated by Rumsey, by far the larger number were boys.

Croup occasionally assumes an epidemic feature, and it has been supposed that it might even be infectious, though of this there is not sufficient proof. It is most frequent in winter, late in autumn, and early in spring, particularly during the prevalence of northeasterly winds, and is often complicated with disease of the lungs, bronchiæ, tonsils, and fauces.

Laryngitis sometimes becomes *chronic*, or it may have a disposition to assume this type from the very beginning. Such an alarming degree of prevalence has this form of the disease assumed among our clergy that it may almost be viewed in the light of an epidemic. The inflammation is confined exclusively to the mucous lining of the larynx, and its peculiar characteristic is to terminate in ulceration. As the malady advances the uvula becomes elongated, the tonsils and soft palate are ulcerated, and the vocal cords are so much thickened as to encroach upon the glottis. The lining membrane of the larynx is usually tumefied, its glands are enlarged, and its vessels are engorged with dark blood.

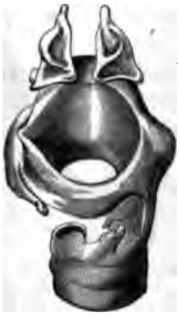
Inflammation of the larynx sometimes terminates in *ulceration*. This is very common in persons who are cut off by tubercular phthisis. In 102 patients, M. Louis found the epiglottis ulcerated in 18, and the rest of the organ in 23. The erosions in the former of these structures were nearly always seated on the inferior surface; and, although they were generally superficial, yet they sometimes extended into the substance of the cartilage, destroying it partially in four cases, and completely in a fifth. In the larynx, properly so called, the ulcers were usually deep, from one to two lines in diameter, and of an irregularly circular shape, with pale grayish-looking edges, occasionally indurated and brittle. Their most frequent seat was, first, at the junction of the vocal cords; then these cords themselves; next, the base of the arytenoid cartilages; and, finally, the interior of the ventricles of Morgagni. Sometimes the vocal cords were partially destroyed, and the arytenoid cartilages stripped of their natural coverings. A fact worthy of notice, in connection with this subject, is, that ulcerations of the epiglottis were remarked twice as often in men as in women.

The textures in the immediate vicinity of these erosions are seldom much altered, either in color or consistence. When the symptoms which precede dissolution are denotive of high inflammatory action, the mucous membrane is apt to be reddened and slightly softened; but, in most cases, it is of a grayish hue, moderately dense, or even indurated.

Ulceration of the cartilages of the larynx occasionally leads to perforation, the symptoms which precede dissolution resembling those of phthisis. The diseased structures are slightly tumefied, and softened around the ulcers, the edges and base of which are rough, and of a light brownish color. The perichondrium always participates in the mischief, being injected, dark, thickened, ragged, and bathed in unhealthy looking pus. These ulcerations are most frequent in venereal, mercurial, and phthisical affections, in which large portions of these cartilages, or even entire pieces, are sometimes discharged.

The laryngeal cartilages are liable to the *osseous transformation* (Fig. 137). The pieces in which this change, which is natural in the aged, is most apt to take place, are the thyroid and cricoid, of each of which I have seen a number of specimens. When thus affected, these bodies are usually very brittle, and contain a considerable quantity of thin, reddish, oily fluid. I have seen them, however, quite hard and firm, like the most perfect bone. When found in advanced life, ossification of these cartilages is not to be regarded as a morbid condition, but as a natural process, which often commences as early as the thirty-fifth or fortieth year, and progresses until the conversion is completed.

Fig. 137.



Ossification of the cartilages of the larynx. From a specimen in my collection.

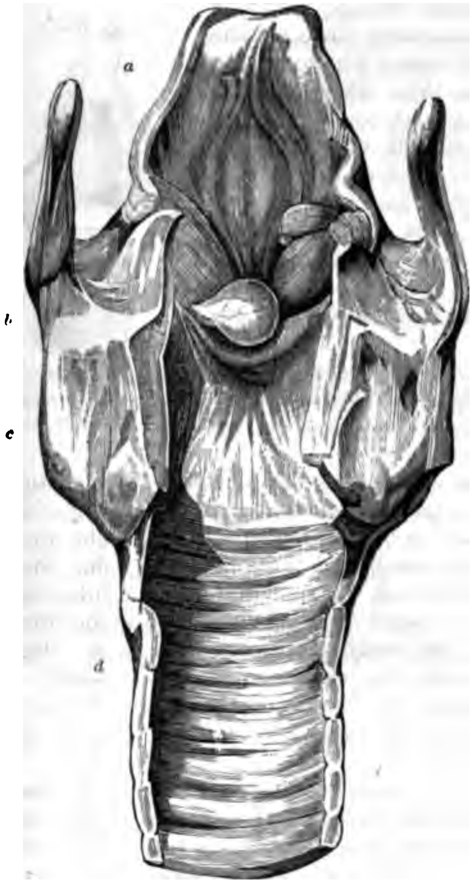
Ossification of the arytenoid cartilages is extremely rare, and of ossification of the epiglottis there is hardly a well authenticated case on record.

The *epiglottis* may be affected without the rest of the larynx participating in the lesion. The simplest form of disease is thickening of its mucous membrane, with ulceration of its inferior surface. The abrasions are generally small, superficial, and irregularly circular, their base, for the most part, being formed by the submucous cellular texture, though occasionally they extend into the substance of the fibrocartilage. Sometimes, indeed, this body is entirely destroyed. Occasionally, the epiglottis is remarkably shrivelled and contracted, or singularly thinned and elongated, its form being altered so as to represent the shape of a battledore, the narrow extremity being at the mouth of the larynx.

The *muscles* of the larynx may also be diseased. In some cases, they are infiltrated with tubercular matter; but more commonly they are atrophied, and thus cause various alterations of the voice, being no longer capable of producing proper tension of the fibro-elastic structures of the organ. The vocal cords are occasionally affected. They have been found converted into a soft, inorganic pulp; and occasionally they are entirely destroyed, leaving the thyro-arytenoid muscles completely bare. In chronic inflammation, it is very common to find the ventricles of the larynx contracted; so that, in the advanced stages of the disease, they are merely represented, as it were, by a superficial transverse groove. This narrowing seems to arise from hypertrophy of the mucous and submucous textures, by which the edges of the cavities are gradually approximated.

*Polypes*, of the same nature as in other parts of the body, are occasionally found in the larynx. Being of various sizes, and of a globular or conical figure, they are usually attached by a thin narrow pedicle, their free extremity being sometimes bifurcated. They are of a fleshy consistence, more or less elastic, and of a pale rose, grayish or whitish color. When laid open they are found to consist of cellular tissue, or of cellular tissue and fatty substance, invested by a prolongation of the mucous membrane. In their volume they vary

Fig. 138.



Polype of the larynx. *a.* Tongue; *b.* Polype; *c.* Larynx; *d.* Trachea.—From RYLAND.

from that of a large bean to that of a hickory-nut or even a guinea egg, and they are generally attached either to the ventricles of the larynx, to one or both of the vocal cords, to the lips of the glottis, or to the root of the epiglottis. When they are very large. or when their pedicle is of considerable length, they may project into the pharynx, over the lateral boundaries of the larynx. In some instances a sort of pouch is formed within the larynx for their accommodation. Fig. 138 represents a small pediculated polype attached to the left vocal cord.

These polypous growths are most common after the fiftieth year, in persons affected with pulmonary phthisis. They have been observed with nearly equal frequency in both sexes.

The interior of the larynx is sometimes the seat of *warty excrescences*, not unlike those found upon the male and female organs of generation. They are usually connected with thickening of the lining membrane, and are probably the result of a syphilitic taint of the system. They are attached either by a narrow pedicle or a broad base, and vary in length from half a line to a quarter of an inch; in their shape they are rounded, ovoidal, or conical; they are of a soft, fleshy consistence, and of a grayish or pale reddish color. Their surface is sometimes fissured or tuberiform, like that of a cauliflower. When these bodies are very numerous, the surface of the larynx looks as if it were studded with them.

*Tubercles* and hydatids are also sometimes found in the larynx; the latter are very rare, and the former generally coexist with pulmonary phthisis. Carcinoma of the larynx is also very uncommon. In fact, I am not aware that scirrhus, colloid, or melanosis has ever been met with in this situation. Encephaloid is likewise extremely rare.

2. *Trachea.*—The diseases of the trachea may be classed under the

heads of inflammation, ulceration, stricture, dilatation, laceration, and ossification.

*Tracheitis* exhibits the same anatomical characters as inflammation of the larynx. The lining membrane is crowded with multitudes of minute florid vessels, its follicles are enlarged and unusually distinct, and its surface is besmeared with thick ropy mucus. Purulent fluid is occasionally found; and in some instances, as in croup, the whole tube is lined with a layer of adventitious membrane. Softening is seldom or never present, either in this affection, in laryngitis, or in inflammation of the bronchiæ. In chronic cases, the redness is less; but the vessels have occasionally a varicose arrangement; and the mucous tunic may be ulcerated, thickened, or indurated.

*Ulceration* of the trachea is not unfrequent in tubercular phthisis, Louis having noticed it in 31 patients out of 102, who died of this disease under his care. More common in the inferior than in the superior half of the tube, and behind than in front, or at the sides, the ulcers are generally of a circular shape, sometimes oval or oblong, and from the twelfth to the sixth of an inch in diameter, with flat, reddened edges, as if they had been scooped out of the subjacent cellular tissue. In some instances, the erosions are so small, close, and numerous, as to give the whole of the inner surface of the trachea a sieve-like aspect. When large and deep, the ulcers may denude the cartilaginous rings, invade their substance, and finally, destroying them, lead to perforation. In a few instances, there is a complete removal of the mucous lining over nearly the whole of the muscular structure, which, in such cases, is always much thickened and indurated. Ulcers of the trachea sometimes heal.

The trachea is liable to become contracted by the thickening of its lining membrane, thus forming a *stricture*, varying in length from a few lines to several inches. In other cases the diminution of the caliber of the tube may be produced by the pressure of an aneurismal tumor, an abscess, an enlarged thyroid gland, or a mass of diseased lymphatic ganglions. The degree of contraction may vary from the slightest change in the natural size of the trachea to almost complete obliteration.

*Dilatation* of the trachea may occur under two varieties of form; in one it affects the entire circumference of the tube, in the other it is limited to its posterior surface. In the first, which is the more frequent of the two, the walls of the trachea are atrophied, and its caliber is more or less increased in diameter, sometimes a fourth or even a third beyond the normal state. The dilatation seldom involves the whole length of the canal; it is most common in old subjects, and is usually associated with marasmus and pulmonary emphysema.

The second form of dilatation is the *saccular*. It is confined to the posterior wall of the tube, and consists in an extrusion of the mucous membrane across the muscular fibres, which are unusually florid and hypertrophied, while the yellow elastic tissue behind them is wasted and hardly perceptible. The mucous lining itself is thickened, and sprinkled with enlarged follicles. The number of sacs varies; sometimes, there is only one, sometimes there are two or three, and sometimes, again, they extend along the whole course of the trachea, and even beyond it to the bronchial tubes. They are of a rounded or ovoidal shape, and rarely exceed the volume of a cherry or filbert. This form of dilatation is generally produced under the influence of chronic inflammation of the lining membrane of the trachea.

*Laceration* of the trachea is unusual. The immediate cause of the accident is generally a violent and sudden effort at inspiration after the integrity of the tube has been impaired by atrophy or ulceration. The following case, for which I am indebted to Dr. Thomas Marshall, of Virginia, affords an excellent illustration of at least one form of this lesion.

The patient, Thomas Partriot, a large muscular man, aged twenty-eight, an inmate of the Philadelphia Hospital, Blockley, labored under symptoms of asthma, attended with immense difficulty of inspiration and great loudness of the respiratory sounds, completely obscuring the sounds of the heart. On the day of his death, which took place nearly a month after his admission, the cellular tissue of the neck and chest became enormously emphysematous as low down as the eighth rib. The lungs were found to be very much collapsed, and there was a large aneurismal tumor at the arch of the aorta, compressing the trachea, and diminishing its caliber. Immediately above the tumor, between two of the rings of the tube, a little towards the left side, was an elliptical opening, about two lines in length by one line in breadth. The walls of the aneurism were thick and firm. The opening in the trachea had evidently been produced by the desperate inspiratory efforts of the patient, a short time before he expired, the coats of the tube having been atrophied by the pressure of the aneurism.

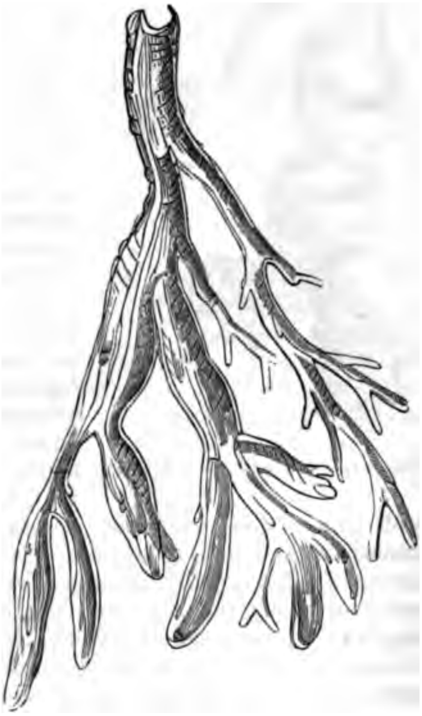
The rings of the trachea, being of a fibro-cartilaginous texture, seldom *ossify*. When this transformation takes place it usually occurs in small points, which, coalescing, may at length embrace the entire ring, as I witnessed, not long ago, in a man seventy-five years of age. The different tissues of the tube were remarkably dense, inelastic, and brittle, requiring only slight traction to tear them. All the rings were completely ossified.

3. *Bronchiæ.*—Acute bronchitis, although it may exist as an independent disease, yet in most cases it is united with inflammation of the trachea, larynx, or pulmonary tissue. The mucous coat is found, on dissection, to be deeply injected, and of a bright crimson, lilac, or purple color, diffused, or in patches of various size. It is rarely much thickened or softened; but sometimes it is augmented in firmness and density, so as to tear no longer with the same facility as in health. Purulent matter is occasionally observed; and, in violent cases, it is not unusual to find the smaller tubes filled with bloody serosity, blended with froth and globules of pus. In the early stage of the disease, there is always a suspension of the natural secretion. In a short time, however, this is re established, and it is then found to be thin, transparent, and somewhat acrid. As the inflammation advances, it becomes

thicker and more abundant, assumes a yellowish color, with a slight greenish cast, and adheres with so much firmness and tenacity to the bronchial tubes, as to be expelled with great difficulty. Obstruction is thus created in the air-vesicles of the lungs, and hence, on opening the thorax, these organs seldom collapse.

In *chronic bronchitis*, a disease of very frequent occurrence, the color of the mucous tunic is usually several shades darker, verging more on livid, violet, or mahogany. Not unfrequently, however, the membrane is of a light grayish tint, or even much whiter than in the normal state. The thickening and augmentation of density are carried much farther than in acute bronchitis; and the natural secretions are usually very copious, opaque, of a deep yellowish color, and almost always puriform. With these signs of disease, we frequently find small ulcers, hypertrophy of the mucous and other textures, and dilatation of the bronchial tubes. Softening is sometimes present, but never to any very great extent.

Fig. 139.

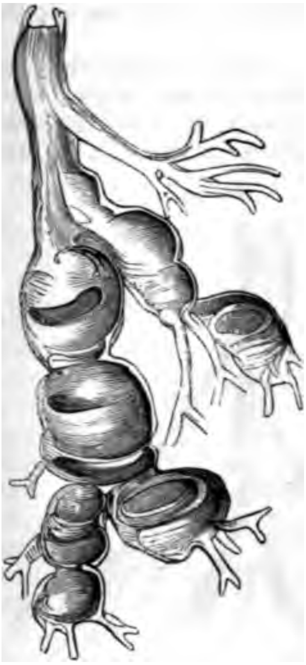


Uniform dilatation of the bronchiæ.

There is a form of chronic bronchitis in which casts of lymph are continually being thrown off from the mucous membrane of the bronchial tubes. These casts vary much in size; at times they are accurately moulded to the tubes and of considerable size, but most generally they are merely fragments of a yellowish exudation-matter. The appearance of the mucous membrane in this plastic bronchitis has not, as yet, been accurately determined. In chronic bronchitis, the expectoration is generally puriform, and sometimes of a greenish, dirty grayish, or brownish color, from the admixture of black pulmonary matter. In neither of these complaints are the sputa much offensive; in most cases, indeed, they are perfectly inodorous.

*Ulceration* of the bronchial mucous membrane is less frequent than that of the trachea, and still less than that of the larynx. The ulcers are generally small, clean, superficial, and of a dirty grayish color, with somewhat tumid and reddened edges. They seldom extend beyond the mucous and submucous textures, and are rarely met with in the small bronchial tubes.

Fig. 140.



Sacculated dilatation of the bronchiæ.

*Dilatation* of the bronchiæ is frequently met with in old asthmatics, and in children after severe attacks of hooping-cough. It presents itself under two varieties of form. In the first (Fig. 139), the dilatation is uniform throughout, and may attain the diameter of a goose-quill, if not of a finger. Sometimes several branches of the same trunk are thus affected, each terminating in a sort of cul-de sac. In other cases, the dilated tube regains its normal caliber, and ends in the usual way. In the second variety (Fig. 140), the bronchia presents a nodulated appearance, like a varicose artery or an absorbent vessel, forming a series of globular swellings, on each side of which the canal is of the natural size. Occasionally, there is only one such dilatation, which may attain the magnitude of a cherry-stone, a marble, or a walnut.

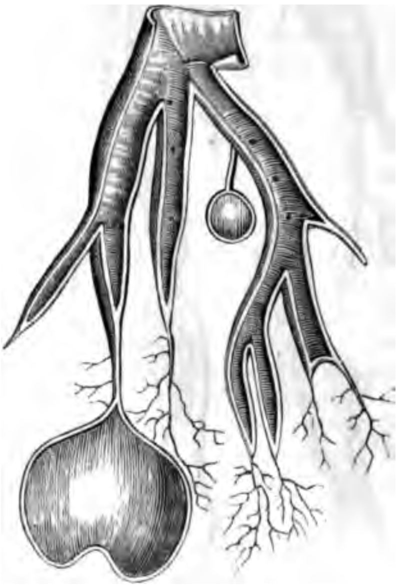
The appearances of the mucous membrane in this affection are various. In the generality of cases it is thickened, injected, and indurated, with its surface covered with dense, inspissated mucus. In others, especially in the second variety of the disease, the membrane is transparent, and so extremely attenuated as to look like a shining vesicle. Occasionally, again, all the component tissues are in a state of hypertrophy, or they are indurated, rigid, and almost of a fibro-cartilaginous consistence. Cases also not unfrequently occur in which the mucous tunic is softened, and convertible into a grayish pulpy substance. When the dilatations are considerable, and embrace a large number of tubes, the intervening pulmonary tissue is hardened, probably from the effects of chronic irritation, imperfectly crepitant, and of a much lighter color than natural.

This lesion is most common in the upper lobes of the lungs, and rarely affects the entire organ. It is usually dependent upon chronic inflammation, and is sometimes produced with much celerity. In hooping-cough, it has been known to attain a very considerable height in the course of a few months. A frequent, forcible inhalation of air, when the bronchiæ are enfeebled by disease, and obstructed with thick, ropy mucus, seems to be the immediate cause of this dilatation. It occurs at all periods of life, and is occasionally observed in infants.

Dilatation of the bronchial tubes may be the result of the infiltration of the cellular tissue of the lung with plastic matter, connecting the air-cells and lobules. In this disease, termed by Corrigan *cirrhosis* of the lung, the dilatation is probably owing to the slow contraction of the tissues between the tubes, thus drawing the parietes of one canal towards the parietes of another; and to the expansive action of the thorax in inspiration, causing the tubes to dilate, whilst the air-vesicles are incapable of any such action.

*Obliteration* of the bronchial tubes affects mainly the smaller branches, especially when it is produced by inflammatory irritation, accompanied with effusion of lymph. In such cases, the contraction is liable to be mistaken for an obliterated vessel. When, on the other hand, it is caused by the pressure of an external tumor, it occasionally involves the larger-sized branches, or even one of the primitive trunks. Hypertrophied lymphatic ganglions sometimes give rise to an obstruction of this kind, followed by a gradual wasting of the corresponding lung. The lesion under consideration is most common in the superior lobe of the pulmonary organs; a circumstance which is easily explained by the great frequency here of tubercular disease, with which it often coexists. The number of tubes that may be thus affected is variable; occasionally, only a single one is obliterated; at other times, the lesion is observable in three or four; and in a few rare cases, all the branches of an entire lobe are implicated.

Fig. 141.

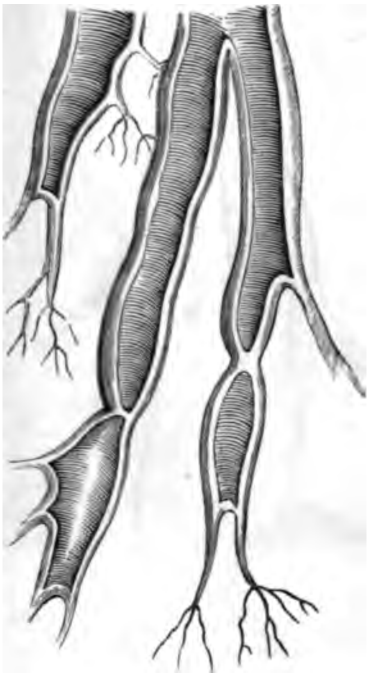


Obliteration of the bronchia.

Obliteration of the air-passages presents itself under two varieties of form. In the first, which is by far the more common, the tube is uniformly contracted throughout its entire length, being converted into a firm fibro-cartilaginous cord, from the sides of which numerous processes are detached, which ramify in an arborescent manner, and the diameter of which scarcely equals that of a bristle (Fig. 141). This variety, which may be said to resemble the continuous stricture of the urethra, usually affects the smaller divisions of the bronchiæ, and is almost always complicated with dilatation, the caliber of the tube above the constriction being seldom perfectly natural.

In the second variety (Fig. 142), the obliteration occupies only a very small portion of the tube, and is observed principally in bronchiæ of the second and third order. The affected part rarely exceeds half an inch in length; generally, indeed, it is not near so long, and not unfrequently it presents the appearance as if the tube had been compressed by a narrow tape or ligature. In this variety, the diameter of the bronchiæ above and below the obliterated point may be natural, diminished, or, as is more commonly the case, increased. Several tubes may present this species of contraction in the same lung.

Fig. 142.



Obliteration of the bronchiæ.

The causes of this lesion are various, but they may all be referred to the following heads: 1, the formation of fibrinous concretions; 2, thickening of the mucous membrane; 3, external pressure; 4, the existence of accidental products within the tube. Of these, the first and second are by far the most common, and they are both the immediate result of inflammatory irritation. The principle on which the one acts is similar to that which obtains in the production of contraction and obliteration of the arteries: the type of the other is to be found in the formation of stricture of the urethra, the nasal duct, and œsophagus. To explain. It is well known that the bronchial tubes are liable to inflammation, followed, not unfrequently, by an effusion of plastic lymph. The substance thus poured out being permitted to remain, it gradually contracts adhesions with the mucous membrane; and, in this way, an effectual barrier is formed, by which the ingress of the air is permanently interrupted. Thus, the tube is deprived of its function; and, in time, converted into a firm, fibrous cord, like an artery that has been tied with a ligature.

Thickening of the mucous membranes is observed in all parts of the body in which these structures are found; and it is therefore not at all surprising that it should occasionally produce narrowing and obliteration of the bronchiæ. In the urethra it is a frequent cause of stricture; in the nasal duct of lachrymal fistule.

The third cause which has been enumerated, as liable to produce obliteration of the air-passages, is external pressure. This may be occasioned, as already stated, by a tuberculated lymphatic ganglion, an aneurismal or other tumor, or, as more generally happens, by pleuritic effusions, exerting a permanent influence.

Lastly, obliteration of the bronchiæ is occasionally caused by the presence of inspissated mucus, by deposits of tubercular matter, and by the inhalation of particles of foreign substances. A peculiar *flat-*

*tening* of the left bronchial tube is occasionally produced by dilatation of the cavities of the heart, especially the left auricle.

The mucous membrane, near the point of obliteration, may be normal, thickened, or attenuated: in some instances it is unnaturally red, softened, or incrusted with lymph. In the majority of cases, as was previously stated, the lesion is associated with dilatation, either of the same, or of the neighboring tubes. This is particularly apt to happen when it implicates the larger trunks. The parenchymatous substance itself is variously altered. Frequently it is remarkably emphysematous, or even rarefied; and, on the other hand, it is sometimes quite dense, solidified, and impermeable to the air. The adjoining vessels are seldom much affected, except when the obliteration occupies a large extent of surface; in which case, the smaller branches are often very much diminished in size, plugged up with fibrinous concretions, or transformed into dense, thread-like cords, which are easily distinguished by their dark grayish color.

The consequences of obliteration of the bronchiæ are exceedingly variable, and can be pointed out only in a very general manner. When of limited extent, the lesion does not produce any marked difficulty, as the neighboring tubes, under such circumstances, are always rendered sufficiently large to compensate for the loss sustained by the affected part. Should it, on the contrary, be more considerable, the effects will of course be more serious. The corresponding portion of the lung, for example, being deprived of air, will gradually fall into a state of atrophy, its surface will become puckered, and its substance rendered abnormally dry and dense, almost like a piece of liver.

The bronchiæ are liable to *ossification*, by which many of the more minute, and even some of the larger branches are occasionally converted into hard, solid pencils, perfectly impermeable to the air. Andral[1] gives a singular example of ossification of these tubes. In dissecting the body of an old man, he found the lung full of hard masses, which were composed of an infinite number of bony spicules, arranged in a beautiful arborescent form, with a cavity in each so small as scarcely to admit a hair. Laennec and some others speak of having met with polypous growths in the bronchiæ; but the occurrence of these bodies in this situation is by no means established.

## SECTION II.

### LUNGS.

The pathological changes which are displayed in the lungs, may be arranged under the following heads: 1, acute inflammation; 2, abscess; 3, gangrene; 4, chronic inflammation; 5, œdema; 6, emphysema; 7, apoplexy; 8, hypertrophy; 9, atrophy; 10, serous cysts; 11, hydatids; 12, calcareous concretions; 13, encephaloid; 14, melanosis; 15, tubercular phthisis.

---

[1] Pathological Anatomy, vol. ii. p. 308.

1. *Acute Pneumonitis in the Adult.*—Inflammation of the pulmonary tissue, usually denominated pneumonitis, is a very common and fatal disease, especially in cold climates, where it not unfrequently prevails epidemically. Commencing with all the symptoms of an ordinary catarrh, it is soon followed by more or less pain in the chest, difficult respiration, and convulsive cough, with expectoration of a thick, ropy mucus, always streaked, in bad cases, with blood. If the patient succumb, the anatomical characters will be found to vary according to the extent of the inflammation, its severity, and its duration. In this respect the disease may be considered as being divisible into three stages, each of which has some features peculiar to itself. In the first, the pulmonic tissue is marked by excessive engorgement of blood; in the second, it is dense, and hepatized; and in the third, it is infiltrated with purulent matter.

In the first stage of the disease, the inflammation appears to be wholly confined to the parenchymatous texture, the only change observable in the bronchial tubes being preternatural vascularity of their lining membrane. The lung is externally of a dark livid color, pits on pressure, and has an unusually heavy, solid feel. With these changes, the natural crepitus and elasticity are impaired; and hence, on opening the chest, the organ seldom completely collapses. The internal structure exhibits various shades of color, from crimson red to livid black, occurring either continuously, in large patches, or in small circumscribed spots, according to the extent of the disease. When cut, blood freely issues from the incision, mixed with white frothy matter; the intervesicular cellular tissue is infiltrated with a large quantity of serosity; and all the vessels are in a state of the utmost engorgement. The lung, in this condition, still floats in water, owing to the fact that it still contains air, and, by careful washing, may be made to resume its spongy, vesicular structure, together with most of its normal characters. In very violent cases, such, for example, as run a very rapid course, we sometimes meet with small hemorrhagic effusions, traceable to ruptured vessels; and also with slight softening of the pulmonic tissue. The duration of this stage is usually from one to five days.

In the second stage, the lung is hard and solid, being converted into a heavy, inelastic substance, similar to that of the liver. The crepitus, so distinct in the sound state, is no longer perceptible; the organ does not collapse, or only slightly, on opening the chest; and if the affected part be torn across, it will exhibit a large number of granulations, which are nothing but the natural air-cells filled with bloody inspissated lymph. These little bodies are of a spherical shape, closely grouped together, and so solid that, with great care, they may be lifted out of their bed. The parenchymatous texture is specifically heavier than water, and of a deep fleshy red, interspersed with various shades of grayish, pink, brown, or even black: it is much more friable than in the preceding stage, breaks readily down under the finger, and is so dry that but little blood follows the knife employed in dividing it. By scraping the incised surface, however, or pressing the part between the fingers, a small quantity of sanguinolent fluid may be obtained, mixed either with thin froth, or, as more frequently happens, with purulent matter. There may also be observed along the incision a considerable number of whitish-looking points and striæ, which correspond with unaltered portions of bloodvessels and bronchial tubes. This stage seldom continues beyond three or four days, when it passes into that of purulent infiltration.

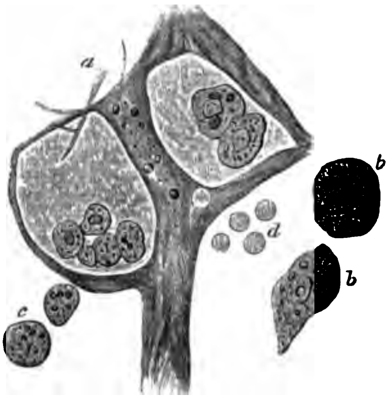
It has just been seen that the color of a hepatized lung is liable to considerable variation. This is owing altogether to the nature of the effused fluids on which the solidification depends. When the product consists simply of plastic lymph, the hepatized part is generally of a grayish white; but when this substance is blended with hæmatin, as it commonly is when the inflammatory irritation runs high, the color is always more or less red.

In the third stage, the lung, although it exhibits the same or even a greater degree of hardness, and the same granular structure, as in the second, assumes a pale yellowish cast, variegated with hepatized patches of red, gray, or bluish. A pus-like fluid always exists in this state, appearing at first in small isolated points, but which in a short time coalesce, and thus impart to the pulmonic tissue a uniform citron color. If an incision be made into the lung, it will be followed by the escape of an opaque ropy fluid, evidently of a purulent nature, but almost devoid of smell, or at least much less offensive than the matter of an external wound. As might be expected, from what has been just stated, the parenchymatous structure is extremely moist, soft, and lacerable, the slightest pressure of the finger converting it into a yellowish, pulpy mass. The smaller bronchial tubes, in the third stage of pneumonitis, are completely obstructed; the larger ones, on the contrary, contain more or less purulent matter, and their mucous lining is thickened, injected, and of a brownish red color.

The anatomical characters of the three stages here described frequently occur in the same lung, dividing it into so many zones, which gradually and insensibly run into each other.

The minute changes discoverable by the aid of the microscope and by chemical analysis vary considerably according to the stage of the disease. At the commencement of the first stage the air-vesicles and their

Fig. 143.

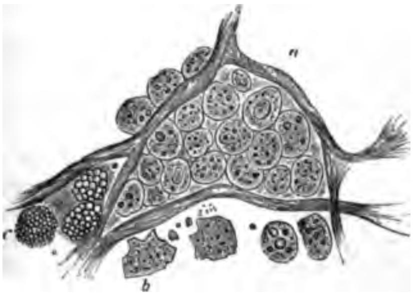


*a.* The fibrous tissue forming the walls of the air-cells, distinct and inclosing a few granules; *b.* Very granular epithelial cells of bronchiæ and air-vesicles; *c.* Small nucleated cells and exudation-corpuscles, lying partly within, partly outside of the air-vesicles; *d.* Blood-corpuscles.—After Dr. DA COSTA.

fluid contents are more granular than in normal or simply congested lungs. As the inflammation leads to deposit of a more solid character, we find a large number of exudation-corpuscles, as well as blood-corpuscles, and the epithelial cells are more granular. Fig. 143, by Dr. Da Costa,[1] represents this condition.

In the second stage the air-cells are blocked up by lymph, and round or slightly oval inflammatory cells may be detected lying closely together on the basement membrane of the air-vesicles. These cells are extremely varying in contents and shape. Some inclose one or two distinct nuclei, others are entirely filled up by granules. Other bodies found in the exudation are fibrinous casts, first noticed by Remak, by whom they are described as ramifying through the smallest bronchial tubes, and even through the air-vesicles. Fig. 144, represents lung tissue in a state of red hepatization.

Fig. 144.



*a.* Air-vesicles filled with inflammatory cells, some of which are nucleated; *b.* Concrete albuminoid masses; *c.* Granule-cells.—After Dr. DA COSTA.

The third stage is generally believed to be owing to the occurrence of suppuration. Yet pus-corpuscles are by no means the most prevalent element. Dr. Da Costa, in the work referred to below, describes distinctly marked corpuscles much larger than those of pus, and filled with granules and small oil-drops. Ether clears them to a large extent of their granules, and renders them transparent vesicles; a circumstance which proves the fatty nature of the contents, and would lead, taken in connection with the frequent absence of pus-cells, the soft broken-down appearance of the lung parenchyma and the increased quantity of fat which can be detected in solidified lung, to the view that gray hepatization is, in many instances, not a true suppuration, but rather a breaking down of the exudation, not dissimilar to a fatty degeneration. Be this as it may, it is undoubted that the ordinary elements of suppuration are not present in a large number of cases of gray hepatization, and especially are they absent in that heavy, dense, yellowish-gray variety, the result of a peculiar kind of inflammatory lymph, which, on account of its color, has always been confounded with the third stage of pneumonia.

The chemistry of the pneumonic lung is not satisfactorily understood. The peculiar lung-acid seems to increase; and there is also more fat.

Much diversity prevails in regard to the extent of the disease. Sometimes we see it occupy almost the whole lung; most generally, however, it affects only a single lobe, or small detached masses. We never find the whole of both these organs hepatized at the same time, for the obvious reason that an obstruction of this kind would be incompatible with the respiratory functions. The right lung suffers more frequently than the left. Thus, in 868 cases, analyzed by Dr. Lombard, of Geneva, 195 occurred in both lungs, 260 in the left, and 413 in the right. Various explanations have been proposed of this fact; but none are sufficiently plausible to deserve special mention.

---

[1] American Journal of Medical Sciences, October, 1855.

The disease ordinarily begins in the inferior parts of the lung, from which it radiates in different directions, until it involves a greater or less extent of tissue. This statement accords with that of Laennec, and many of the best authorities of the present day; but it is opposed to the results of the observations of Broussais, Chomel, and several other highly respectable pathologists. In fifty-nine cases, Chomel found the upper lobes affected in thirteen; the inferior, in eleven; the whole of one lung, in thirty-one; the posterior parts, in two; and the middle, in one.[1] The universality of this occurrence, on the whole, is perhaps not so great as was imagined by Laennec: still, I feel satisfied, both from my own observations and those of others, that his statement is applicable to the great majority of cases of this complaint, whether occurring in old age, in infancy, or in youth.

*Acute Pneumonitis in Children.*—Pneumonitis is a very common disease in children under six years of age; it attacks boys more frequently than girls, and usually occupies the lobules instead of the lobes, as it almost always does in older subjects. Hence the term *lobular*, by which it is generally designated by pathologists. This form of the disease may occur as an idiopathic affection, but in general it is ingrafted upon hooping-cough, bronchitis, croup, typhoid fever, measles, scarlatina, and gangrene of the mouth. It may begin at a single point, or simultaneously at several, and in its progress involve an entire lobe, or the greater part of one entire lung. It is ordinarily double. The most frequent complications of infantile pneumonia are, dilatation of the bronchial tubes, emphysema, especially the vesicular variety, pleuritis, and inflammation of the bronchial lymphatic ganglions.

The disease, anatomically considered, may be divided into three stages. In the first, the affected part has a marble, red, or rosy-gray complexion; and is somewhat softer, or a little less firm, than in the healthy state; it floats in water, crepitates under the finger, and emits, when pressed, a thin, frothy fluid. In the second stage, the pulmonary tissue is of a deeper color, reddish-gray, violet, or purple, generally well-circumscribed, solid, knotty, almost increpitant, and indisposed to collapse on opening the chest. The affected part, which often comprises from three to five lobules, is of the size of an almond, or a small walnut, and usually of a rounded shape, though sometimes it is elongated, ovoidal, or polyhedral; the mass is easily penetrated by the finger, sinks in water, exhibits a rough granulated appearance on being torn, and is saturated with a sanious, aërated fluid. In the third stage, the diseased structure is of a grayish, or yellowish color, friable, and infiltrated with globules of pus; it bears, in fact, a very close resemblance to gray hepatization; when cut, the part has a shining homogeneous aspect; the vessels are still visible, as white lines; and the bronchial tubes, although much compressed, may be traced with a little care. The lining membrane of the tubes may preserve its white, transparent appearance; but in general it is abnormally red, and bedewed with mucous fluid. When inflammation is very intense, or spread over an unusually large surface, the secretion is sometimes puriform, or purulent.

---

[1] Laennec on the Chest, p. 204, note, by Dr. Forbes.

It is not often that the pneumonia of children terminates in the formation of abscesses. When this takes place the pus is of a thick, cream-like consistence, and of a yellowish or greenish-yellow color, non-aërated, and perfectly free from odor; sometimes it is thin and reddish; and in a small proportion of cases it is mingled with clots of blood, or flakes of fibrin. The abscesses vary in size from that of a millet-seed to that of a pea; there may be only one, or they may be so numerous that they cannot be counted; they are generally round, or slightly oval; and they are found in the centre of the lung, as well as at the surface, to the latter of which they ordinarily tend. In recent cases the matter is immediately surrounded by a layer of hepatized pulmonary tissue; in those of longer standing, on the contrary, it is occasionally inclosed by a false membrane, thin, smooth, and polished, or by a small quantity of concrete pus, or broken down lymph. When several abscesses coexist they sometimes coalesce, and thus form a considerable-sized cavity, either single, or multilocular. The matter is either absorbed, or it bursts into a bronchial tube, and is finally expectorated. When it is situated near the surface of the lung, it may erode the pulmonary pleura, and so escape into the thoracic cavity. This, however, is exceedingly rare.

Considerable light has been thrown upon the whole subject of lobular pneumonia by modern research. MM. Bailly and Legendre, struck with the close resemblance of the affected tissue to fœtal lung, tried the experiment of inflating the apparently condensed organ. The result showed that the lobules could be almost completely restored, being rather in a state of collapse than filled with inflammatory lymph. Much ingenuity has been expended to account for this pulmonary collapse. The causes that give rise to it are undoubtedly most frequently of a mechanical nature, especially the presence of viscid mucus in the smaller bronchial tubes which the patient is unable to expectorate; the pulmonary vesicles thus losing the air they contain. The engorgement is a secondary occurrence.

This collapse may be observed in young children and old persons. It may result in death, or terminate in recovery. The pulmonary tissue is, at times, soft, and frequently it is filled with fluid, but the great distinguishing mark between it and true hepatization, is the possibilty of inflating the collapsed lung.

Pneumonitis frequently terminates, at all periods of life, in *resolution*, especially when it does not transcend the second stage. When this event is about to take place, the preternatural vascularity gradually disappears, the effused fluids are absorbed, and the air-cells regain their primordial volume and figure. Sometimes the pulmonic texture continues for awhile to be œdematous, being characterized by slight dulness on percussion, and indistinctness of the respiratory murmur. The progress of a portion of hepatized lung is more tardy, a considerable period generally elapsing before the granulations give way to the development of the air-filled vesicles. The first perceptible change is a diminution of color, accompanied by an absorption of the lymph which gave rise to the solidification. As the process advances, the pulmonic tissue becomes gradually more yielding and elastic, it loses its dryness and fragility, and is infiltrated with a thin serous fluid, characters which closely assimilate it to the normal texture. In the third stage, resolution is a rare occurrence; but, should this take place, the yellow color may be supposed to be lighter, and the pus more liquid, from the admixture of serum. Air-vesicles afterwards appear, and continue to increase, while the purulent fluid is reduced to small points, which progressively diminish in number as the vesicular structure returns.

2. *Abscess.*—The formation of abscesses, as an effect of pneumonitis, is extremely rare. Laennec states that, in several hundred examinations of persons who died of this disease, he never met with more than five or six cases in which the pus was concentrated into a focus. The testimony of the later pathological anatomists of Europe and this country is precisely of the same import. Broussais declares that he met with this termination only once; Andral and Louis also consider it as very infrequent; and Dr. Horner, who dissected more than fifteen hundred bodies, observed it only in two instances.[1] In my own examinations, I have not been more fortunate, having hitherto seen pulmonic abscesses only in two persons, the one an adult, aged forty, the other a child of fifteen months. In this case, the abscesses, which occupied the inferior lobe of the right lung, were about twenty in number, the largest of which scarcely equalled a cherry-stone. No tubercles were found: the child had been sick about four weeks.

The reason why the termination of pneumonitis by abscess was formerly considered as so very frequent, no doubt arose from mistaking tubercular excavations, which are of such common occurrence in consumptive subjects, for collections of this kind. Of this, any one may convince himself by a careful perusal of the works of Bonetus, Morgagni, and other pathologists of the seventeenth and eighteenth centuries. Even Dr. Baillie,[2] so justly distinguished for the accuracy with which he generally conducted his researches, did not escape this error.

The walls of these abscesses are formed by the pulmonic tissue, which is usually infiltrated with pus, and in a state of putrilaginous softening. In one of the cases to which I before referred, the matter was bounded by a dark, flesh-colored substance, very considerably indurated. Occasionally, the abscesses are encysted, or inclosed by a false membrane: cases of this kind, however, are very rare, and I have never met with them. Their size varies infinitely: in a few instances, they have been found as large as an adult fist; but, in general, they do not exceed a nutmeg, hickory-nut, or small apple. Frequently they communicate with the bronchial tubes, through which the matter is at length discharged, when the cavity heals, and the individual recovers; the mode of cicatrization being, in every respect, analogous to that which takes place in the spontaneous cure of a tubercular excavation. In old cases, the pus is usually of a thick, creamy nature; while in recent ones it is apt to be semi-concrete, from the admixture of an undue proportion of lymph. The purulent depositions are commonly seated near the surface of the lung; seldom deep in their structure.

---

[1] Pathological Anatomy, p. 241.
[2] Morbid Anatomy, p. 42.

Abscesses of the lungs can occur only in association with, or as a consequence of, inflammation, whose limits are properly circumscribed; in other words, the disease must be confined to particular parts, lobes, or lobules. The *rationale* of this is obvious. In universal pneumonitis, death must necessarily ensue before the matter can break up the cellular tissue and collect itself into a focus; which need not be the case when the inflammation is limited, nature, properly assisted by art, being often capable here of warding off this occurrence until after the establishment of the suppurative process.

*Metastatic abscesses* of the lungs are sometimes met with, generally as a result of phlebitis, produced by wounds of the head, comminuted fractures of the extremities, and great surgical operations; they may also arise from burns and scalds, erysipelas, smallpox, and other violent diseases. Their number is exceedingly variable; sometimes there is only one; at other times there are as many as six or a dozen; and occasionally, though rarely, there are several hundred. In their volume they may be as small as a mustard-seed, or as large as a pigeon's egg. They are of a rounded shape, distinctly circumscribed, superficial, and nearly always most numerous in the inferior portion of the lungs. Their contents are of a tough, fibrinous consistence, and of a reddish, brownish, or blackish color. The pulmonary tissue around them is unnaturally vascular, œdematous, hepatized, and friable: the smaller veins are inflamed, and filled with black or reddish concretions. The insidious manner in which these abscesses are developed has been a common remark among pathologists. They are liable to be confounded with pulmonary tubercles, but may be readily distinguished from them by their larger size, by their darker color, and by the fact of their being usually the result of a distant lesion.

3. *Gangrene.*—The lungs are liable to gangrene, sometimes as an effect of acute pneumonitis, but more generally without any assignable cause. The disease may occur in circumscribed spots, or it may invade an entire lobe, or even the whole of one of these organs. It may be readily detected by its intensely fetid odor, and by its greenish

brown, dirty olive, dark brown, or black color. The pulmonic tissue is softened, and converted into an offensive putrilaginous mass, not unlike decomposed blood. When cut, the part affected often gives vent to a turbid, sanious fluid, of a greenish tint, and an almost insupportable smell: in rare cases, the sphacelated mass is dry and friable, like a rotten pear. When the gangrene is circumscribed, an imperfect factitious membrane may sometimes be discovered; but, in most instances, where there is a distinct line of demarcation, the living part is preternaturally injected and infiltrated with sanguinolent liquid, with cellular shreds and vascular filaments hanging from its borders. By degrees, the putrid pulp finds its way into the adjoining bronchial tubes, and is finally ejected by expectoration. The cavity which is thus left, is either filled up with lymph, or, as more commonly happens, its walls are lined by a false membrane, which continues to secrete, for a time, a thin, imperfect pus.

Gangrene of the lungs is of much more frequent occurrence than was formerly supposed. It is most prevalent in cold weather, and occasionally betrays an epidemic tendency. It makes its attacks at all periods of life; but the aged, and especially such as are of intemperate habits, are most prone to it. A singular fact respecting gangrene of the lungs has been witnessed by Dr. Guislain,[1] a French physician. Out of thirteen insane patients who died of inanition in the hospital at Gand, nine were affected with this disease. In one case, both lungs were involved; and in nearly all of them the sphacelation was confined to the posterior and upper part of these organs. How is this occurrence to be explained? The present state of our knowledge does not enable us to give a satisfactory answer.

In my private collection are two beautiful specimens of gangrenous lung, of which I annex a brief description. Of these, one belongs to the circumscribed variety, and was taken from a mechanic, forty years old, who died from its effects. On inspection, I found the left lung, at the part corresponding with the interlobular fissure, reduced, for about one inch in diameter, to a dark, pulpy, gangrenous mass, so excessively offensive that it was almost impossible to remain in the apartment where I was conducting the examination. The eschar, which reached as far as the surface of the lung, communicated with a large bronchial tube, and had been discharged in part by expectoration. The pleura immediately over it was in a state of sphacelation, and the matter was evidently prevented from escaping into the chest by the adhesions which the lung had formed with the wall of that cavity. The pulmonic tissue round the gangrene was rather soft and injected, and the whole surface of the organ was covered with a false membrane, thick, dense, and highly vascular.

In the other specimen, which belongs to the diffuse variety, the gangrene involved nearly the whole of the right lung, which was of a dark, dirty olive color, extremely soft and friable, and exhaled a most intolerable odor. The pulmonary pleura was perforated in several places, and a considerable quantity of black, offensive matter was found in the corresponding cavity of the chest. The disease, in this case, supervened upon an attack of typhoid fever, and was marked by a brownish, fetid expectoration, which set in a few days before death. The patient was a young printer, twenty-three years of age.

---

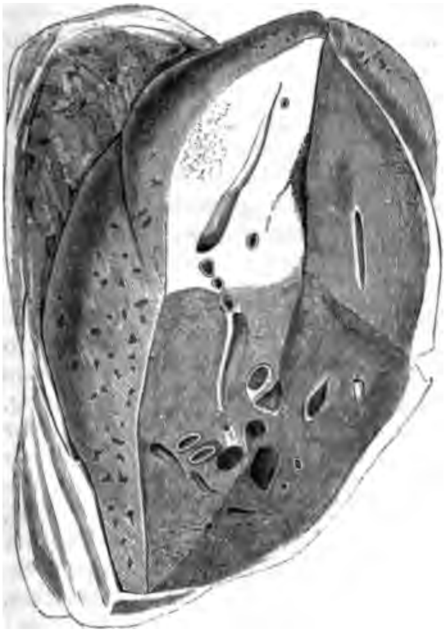
[1] Gazette Médicale de Paris, January, 1836.

The progress of this disease, if at all extensive, is generally rapid; and the expectoration, which is of a dirty black, green or brown color, is so horribly offensive that it may be considered as pathognomonic of the disease.

4. *Chronic Pneumonitis.*—Chronic pneumonitis, as a distinct disease, is extremely infrequent, so much so, indeed, that its very existence has been denied by many writers. That it does occur, however, is indisputable. As a consequence of acute inflammation it is sufficiently common; and the exudation occurs, both in the air-vesicles and in the connecting cellular tissue; and not, as some assert, exclusively in the one or the other of these structures.

A chronically inflamed lung is hard, dense, and dry, yielding little or no moisture on pressure; it tears with a granulated surface, pits under the finger, and cuts a good deal like a sponge. Here and there a reticulated structure, caused by some remains of the air-cells, is visible; and, scattered through various parts of it, numerous tubercles may sometimes be observed, of a pale grayish hue, semi-concrete, and easily removable. The color of the indurated organ being altogether of an accidental character, varies in different cases. Thus, it may be red, grayish, pale yellow, iron gray, brownish, or even black, or these tints may be blended, and so the part have a mottled aspect. In my collection is a specimen of the color of flesh; and another which is of a light grayish hue beautifully dappled with black. These, together with a specimen taken from a young horse that died of pneumonitis, complicated with chronic pleuritis, are the only instances, so far as I now recollect, that I have seen of this affection. In neither of them were there any tubercles. The pulmonary tissue in all was remarkably dry, hard, tough, smooth, and shining when incised, rough and granular when torn. The bronchial tubes seemed to have been

Fig. 145.



Chronic inflammation of the lungs; the air-cells and smaller bronchial tubes being entirely obliterated. From a preparation in my cabinet.

entirely closed: many of the larger vessels were filled with red, clotted, friable blood, and the smaller ones were either obliterated, or so incorporated with the indurated mass as to have completely lost their original features. These appearances are well seen in Fig. 145.

The disease may be limited to a few lobules; but in general it affects one or more lobes, and sometimes one entire lung. It is occasionally observed around pulmonary abscesses, and very commonly around tubercular excavations. The indurated part is usually much diminished in volume, and does not, according to my observation, sink so readily in water as in the acute form of the lesion. The two specimens above alluded to, notwithstanding the induration was very great, were both specifically lighter than this fluid.

Chronic pneumonia may pass into purulent infiltration, abscess, and gangrene. When fully formed, it is doubtful whether it is susceptible of resolution, since the various textures are so firmly cemented together by lymph as to render it impossible for the absorbents to effect their restoration. When idiopathic, the progress of the affection is gradual, exciting little attention until a large portion of the pulmonary tissue has become impermeable to air.

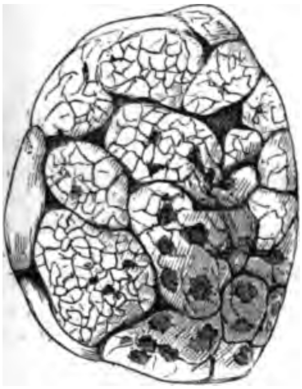
There is a peculiar state of the pulmonary tissue to which pathologists have applied the name of *carnification*. How it is produced is not determined, but the probability is that it is merely one of the effects of pneumonia. It attacks both lungs indiscriminately, and usually occupies their lower extremity. The affected part closely resembles a muscle, the fibres of which are compressed and indistinct; it is hard, dense, and resisting, instead of being soft, flaccid, and friable, as in ordinary cases; it is non-crepitant, and is penetrated with difficulty by the finger; the cut surface exhibits a smooth appearance; and, when pressed, it yields a small quantity of sanious, bloody fluid. Its color is violet, rose, or pale red, and mottled with white radiating lines, which are disposed in the form of lozenges, and indicate the situation of the lobules. The lung itself has a remarkably depressed appearance, similar to what is observed in an imperfectly inflated fœtal lung, so well described by Jörg, under the name of pulmonary atelectasis. It is, indeed, highly probable that carnified lungs are in reality lungs deprived of air, in a state of collapse.

5. *Œdema.*—The lungs are occasionally the seat of œdema, a disease which, as its name imports, consists in an effusion of serum into their cellular texture. The anatomical characters vary according as the lesion affects either the whole or only a part of the respiratory organs. When the entire lung is involved, it does not collapse on opening the chest; it is denser and heavier than in the normal state; pits on pressure; and, when cut, exudes a large quantity of clear, yellowish serosity. This fluid is intimately blended with the interstitial cellular tissue of the organ, into which it is originally deposited, and can be easily discriminated from that which is diffused during the first stage of pneumonitis, by its being less frothy, and of a lighter complexion. The lung, when thus affected, still crepitates on pressure.

This disease is rarely idiopathic; on the contrary, it is usually associated with other dropsical disorders, occurring, for the most part, in worn-out cachectic individuals towards the close of painful and protracted fevers. Sometimes it accompanies organic affections of the heart. Chronic bronchitis likewise predisposes to it; and it is the cause of the embarrassment of breathing which so often exists as a sequel of measles, smallpox, and scarlet fever. The œdema seldom lasts beyond a few days; occasionally, however, it continues for several weeks or even months, when the fluid is either absorbed, or the case proceeds to a fatal termination.

6. *Emphysema.*—Of emphysema there are two varieties—the vesicular and interlobular—the one consisting in a dilatation of the pulmonic cells, the other in the extravasation of air into the interstitial cellular tissue. These two forms seldom coexist; and the latter, compared with the former, is usually regarded, though erroneously, as a most rare disease.

Fig. 146.



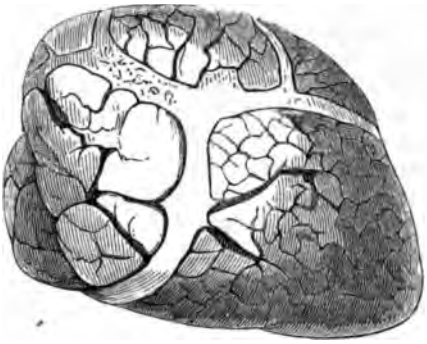
Vesicular emphysema.

In the *vesicular* emphysema (Fig. 146), the air-cells are preternaturally dilated, atrophied, and distorted in shape. Their size varies in different cases. In general, they equal the head of a common pin; in others, they are as large as a currant; in others, again, as big as a cherry-stone, or even a French bean. When the cells are of the latter dimensions, which, however, is very rare, it is not improbable that several of them are thrown into one, by the rupture of the intervening texture: in some instances, notwithstanding, the enlargement evidently results from a single vesicle, the walls of which, instead of yielding to the distending cause, are expanded into thin transparent bags. Occasionally, all the cells disappear from one entire lobule, leaving merely some vascular and cellular shreds. In this manner a capacious cavern is sometimes produced, which projects beyond the surface of the lung, in the form of one or more globules.

The lung, in this variety of the disease, seems to be augmented in volume, and to have lost its natural resiliency. It is considerably paler than the sound organ, less crepitous, more dry and elastic, and does not collapse on opening the chest. Its specific gravity, also, is increased; the surface is often studded with small vesicles; and many of the minute bronchial tubes are in a state of dilatation.

Vesicular emphysema is rarely observed before the age of fifty. It may exist in both lungs at the same time, or it may be limited to one of these organs, to one lobe, or to a small portion of a lobe. In eighteen cases out of forty-two, observed by Louis, it was found to be general throughout both lungs. It is a very common attendant on tubercles, aneurismal tumors of the heart and aorta, enlargements of the bronchial glands, and asthmatic disorders. Amongst the occasional causes may be enumerated whatever has a tendency to over-distend the air-cells of the lungs, as playing upon wind instruments, singing, and loud screaming.

Fig. 147.



Interlobular emphysema.

The second variety, or the *interlobular* emphysema (Fig. 147), consists, as was before stated, in the diffusion of air through the interareolar texture, in consequence of the rupture of some of the pulmonary vesicles. So far as an opportunity has been afforded me of judging, no period of life is, I am inclined to believe, wholly exempt from it. Males, between twenty and thirty, have appeared to me to be particularly subject to it; much more so than at an earlier or a later age, or than the other sex. I have never observed this affection in new born infants; but in one instance, I noticed it in a child of seven months, who died under symptoms of pneumonitis, complicated with hydrocephalus. Of nineteen cases of this disease, of which I have kept a record, six occurred in association with bilious and typhoid fever, four with dysentery, three with hooping-cough, one with acute inflammation of the lungs, four with tubercular phthisis, and one with infantile cholera.

In twelve of these cases, the emphysema affected both organs, though not to the same extent. In five it was exclusively confined to the right lung; in two to the left. In nearly all, it was most distinctly marked along the interlobular intervals and the free margins. In a few only was it noticed at the base of the organ, and in not a single one at the apex, or at the posterior part of the internal surface. Why these differences should obtain, or why certain portions of the lungs should be more frequently affected in this way than others, are circumstances in the history of this lesion which, in the present state of the science, we are totally incompetent to explain.

When a lung is thus affected, the diseased part is easily recognized by its peculiar whitish appearance, which contrasts singularly with the red colored textures around it. It distinctly crepitates under the pressure of the finger, the contained air being readily pushed from one place to another, and the serous covering of the viscus appears, as in truth it is, to be lifted off from the parenchymatous substance. In this way, I have repeatedly known thin, flattened bags to be formed from two to three inches in length, by six or eight lines in breadth, and as perfectly pellucid as the most delicate soap bubble. In other instances, the pleura is raised into little globules, so closely clustered together as to bear a strong resemblance to a string of pearls. But, whatever may be the form or extent of the elevation, the parenchymatous texture beneath is always more or less lacerated, of a pale color, and generally reduced, especially in cases of long standing, to a sort of network, consisting solely of vascular and bronchial ramifications. These are generally arranged in transparent bluish bands, as in Fig. 147.

In this, as in the preceding variety, the lungs do not collapse on opening the chest, and they also cover, to an unnatural extent, the surface of the pericardium, which, especially when the emphysema is very great along the anterior margins of both viscera, is sometimes almost entirely concealed. Occasionally, the air escapes into the cellular substance of the mediastinal cavity, where it is either arrested, or it extends up the neck, and forms an irregularly flattened tumor, which sensibly crepitates on pressure. In this way, the fluid may reach over the whole body. The most frequent cause of interlobular emphysema is the forcible and prolonged retention of the air during severe muscular efforts, as in lifting heavy weights, in parturition, in hooping-cough, croup, and other affections of the respiratory passages.

7. *Pulmonary Apoplexy.*—Like the disease just considered, pulmonary apoplexy may be distinguished into two varieties—the vesicular and interlobular—the blood in the one being retained in the air-cells, in the other, extravasated into the connecting cellular tissue. As might be expected, the anatomical characters vary, as the fluid occupies the vesicular or the interstitial cellular texture. In the former case, the blood is collected into round, circumscribed masses, from the size of a pea to that of a large apple. When incised, the section has a deep red, granular aspect, of the consistence of a hepatized lung, with numerous intersecting vessels and tubes of a much lighter color. By scraping with the handle of the scalpel, the clotted blood is removed from the air-cells, and the part exhibits a beautiful honeycomb arrangement, the pits being separated by irregular partitions.

In the second variety, the fluid ruptures the air-vesicles and is extravasated into the intervening cellular tissue, breaking it down into a ragged, shreddy substance, in appearance not unlike a coarse sponge, saturated with dark blood. Large cells and excavations may thus be formed, penetrating to a considerable depth, and converting the lung, in some cases, into a soft, irregular, fluctuating mass. Occasionally, the apoplectic effusion is so great as to lacerate the pleura, and escape into the thoracic cavity.

When the effusion is very profuse, as when it proceeds from a ruptured vessel of considerable magnitude, death may occur in a few hours, if, indeed, not almost instantaneously. In other cases, the blood is discharged by the mouth, or a portion of it remains, and gradually assumes new properties. If the individual is cut off during the attack, the blood is found, upon inspection, to be of a dark venous hue, and only partially, if at all coagulated. In cases of an opposite character, however, it is uniformly clotted, more or less firm, and of a light brownish, pale, gray, dun, or drab color. These alterations are always more conspicuous in proportion to the length of time that has elapsed since the apoplectic attack, and are dependent upon the absorption of the serum and coloring matter of the extravasated fluid.

The tissues around the clot may be quite sound and crepitous, but commonly they are pale and indurated. Sometimes the clot acts as a foreign body, producing inflammation, softening, suppuration, and even gangrene. Should the effusion be small, limited in extent, or not have caused much injury, it may be entirely absorbed, and the vesicular structure resume its normal characters. In other cases, again, though this is rare, nature makes an effort at reparation by organizing the clot, or inclosing it in a cyst, as in apoplexy of the brain.

The blood, in pulmonary apoplexy, may flow from two distinct sources, either from the mucous membrane of the bronchiæ, as a simple exhalation, or directly from a lacerated vessel. When depending upon the latter source, the hemorrhage is often extremely profuse, and may prove rapidly fatal. Several years ago, I examined the body of a man, thirty-two years old, who died about twelve hours after an attack of pulmonary apoplexy, in which he lost nearly a gallon and a half of blood. The stomach contained almost a quart of this fluid; the bronchiæ, trachea, and larynx were nearly filled with it; and a large tubercular excavation in the upper lobe of the right lung, capable of holding five ounces, and from which the hemorrhage proceeded, was also occupied with it. A loss of blood, of three or four pounds, is by no means unusual in seizures of this kind.

Much dispute existed, at one time, concerning the probability of the blood in this disease emanating from simple exhalation of the mucous membrane of the bronchial tubes. The subject is amply discussed by Bichat, who espoused the affirmative side of the question; and his opinion has been abundantly confirmed by the more elaborate researches of modern pathological anatomists. It is now, indeed, well ascertained that the occurrence is not only possible, but much more frequent than is generally imagined. The hemorrhage, though sometimes profuse, is seldom so great as when it proceeds from a ruptured vessel.

Hypertrophy of the right ventricle of the heart, with contraction of the mitral valves, seems to be the most frequent cause of this lesion. Indeed, apoplexy of the lungs may be said to have the same connection with hypertrophy of the right side of the heart, that apoplexy of the brain has with that of the left, the tendency, in both cases, being to throw the blood with more impetuosity and force upon the respective organs. Should there be a contraction of the mitral valve, the blood will stagnate in the left auricle, and the pulmonary vessels be constantly engorged from the obstacle in the venous circulation. When this state is conjoined with thickening of the walls of the right ventricle, nothing, it may be presumed, would be more easy than the supervention of hemorrhage, whether as a simple exhalation, or as the result of a laceration of one or more vascular branches. The deposit of blood in the pulmonary tissues is also a frequent attendant upon phthisis; and, in some instances, it is found to be *accidental*, the fluid being poured down the windpipe from an ulcerated artery of the tongue, palate, or fauces, or from the bursting of an aneurismal sac.

8. *Encephaloid.*—Encephaloid seldom occurs in the lungs. It may exist under several varieties of form. Thus, it may be diffused through the intervesicular tissues, in small, uncircumscribed patches; or it may be deposited in irregular spherical masses, varying in size from a small pea to that of a full-grown fœtal head; or, lastly, it may present itself in the character of an encysted tumor, which, in fact, is most usually the case. In this variety, the heterologous growth rarely exceeds a common-sized apple, and the capsule surrounding it, although hard and tough, is scarcely the fourth of a line thick, and of a white grayish color; the adhesion between the two structures is usually very slight, and the vessels which are so abundantly distributed upon the latter, can seldom be traced to any great depth into the former. In some cases, the medullary matter occupies only a single cyst; in others, there are as many as six or eight, united together into one lobulated mass. Clots of blood, of a deep red, brown, or blackish color, are frequently intermixed with this substance, altering its appearance and consistence.

Dr. Da Costa recently showed me a beautiful specimen of encephaloid of this organ. It occurred in a man, aged thirty-five, who had been operated on for a cancerous tumor of the knee. The pulmonary disease was evidently secondary. It involved both lungs, and consisted of a great number of large and well-marked nodules, some of which were very vascular, being pervaded by many fine vessels. The intermediate pulmonary tissue was sound, but the pleura over the nodules was thickened.

9. *Melanosis.*—The lungs are liable to melanosis, though this may be classed amongst the rarest affections met with in these organs. It is commonly seen in amorphous masses, in small nodules, in thin, irregular laminæ, or in minute dots. The tuberiform variety, which is perhaps the most common, occurs in globular, oval, or pyriform tumors, from the size of a currant to that of an egg, or even an apple. Sometimes they are encysted, the capsule by which they are inclosed being composed of dense, cellular tissue, about a fourth of a line thick. Their surface is either smooth, lobulated, or tuberculated, their consistence varying between tallow and a lymphatic gland, though occasionally they are quite fluid. The circumjacent textures are generally sound, and the connection between them and the heterologous bodies is often so slight as to require but little dissection to separate them from each other.

There is a variety of black substance, which, instead of being a product of secretion, like that just described, is introduced with the air in breathing, and carried by the absorbent vessels into the intervesicular tissues. It is most common in colliers, moulders, and other persons who are habitually exposed to the inhalation of carbonaceous matter. Old age is the period of life most liable to it, though it has been noticed in comparatively young subjects. The foreign substance may be solid, semi-liquid, or fluid, and may occur as an infiltration, or in the form of granules, or, finally, in lines or streaks, having a retiform or pentagonal arrangement. Both lungs are generally affected at the same time and in an equal degree; they are of a uniform black, or bluish-black color, indurated, friable, and infiltrated with black serosity. Sometimes, especially when the deposit coexists with tubercular disease, they contain excavations, the parietes of which are bedewed with the foreign matter, and which is then often expectorated, for weeks and months together, in considerable quantity. The bronchial lymphatic ganglions almost always participate in the black discoloration.

This matter is without taste or smell, insoluble in muriatic and nitric acid, miscible with water, and of a black color, like charcoal, soot, bistre, or China-ink. It is not bleached by chlorine, nor is it affected by putrefaction. When dried, it burns like charcoal, with scarcely any animal empyreuma, and leaves a considerable quantity of pale-gray ash. It is of an inorganic carbonaceous character, and bears the closest resemblance to lamp-black. In persons, furthermore, whose lungs have been congested for any length of time, it is not unusual to find black pigment in the lung, probably the result of transformed blood. Destructive analysis yields carburetted hydrogen, and the other usual products.

10. *Serous Cysts.*—Serous cysts, containing a thin, limpid fluid, are occasionally found in the lungs. They are more common in the inferior animals, as the ox, sheep, and goat, than in the human subject, and seldom attain a large size. In general, also, they are single, though sometimes several have been seen in the same lung.

11. *Hydatids.*—Hydatids of the lungs are also rare. Of a globular, ovoidal, or pyriform shape, they are of variable magnitude, of a firm, semi-concrete consistence, and usually, if not always, of the acephalocystic kind. Their coats are of a light grayish color, sometimes speckled with opaque, yellowish dots; and their contents, which are generally of a thin, limpid nature, are often milky, brownish, or sero-sanguinolent. The internal surface of the hydatid is frequently rough, and lined with lymph. The number of these bodies is seldom considerable, or their size large. Occasionally, however, there is a very large one, including several of smaller dimensions.

12. *Earthy Concretions.*—Calcareous, earthy, or cretaceous concretions of the lungs are sufficiently common. They usually occur in small rounded nodules, of a grayish-white color, friable, semiconcrete, or very hard, and consisting almost entirely of phosphate and carbonate of lime, with a minute proportion of animal matter. Cases are seen in which these concretions are of a dark color, oval, cylindrical, or pyriform, hard and gritty, or rough on the surface, like a mulberry calculus of the urinary bladder.

Their dimensions are very variable. From the size of a mustard-seed they may attain, and even exceed, that of a peach-stone; though, in the generality of cases, they do not surpass the volume of a currant, a pea, or a small cherry. Their number is in an inverse ratio to their size. The case of a phthisical person is recorded, who, during the eighteen months immediately preceding his dissolution, ejected upwards of two hundred small stones; and in another, between five and six hundred were expectorated.

These concretions are sometimes perfectly white like chalk, and of the consistence of putty, or fresh mortar. They are generally invested by a cyst, which is of a pale bluish, grayish, or drab color, fibrous, or fibro-cartilaginous in its structure, and from the sixth of a line to a line and a half in thickness. There can be no doubt that these concretions, whatever be their color and consistence, are merely degenerated pulmonary tubercles. In proof of this it may be stated that the cretaceous deposit, as it is called, is often seen at one point, the calcareous at another, and the tubercular at a third. The conversion constantly begins at the centre of the morbid mass, in the form of pultaceous, chalky, or putty-like matter, which in time completely subverts the original structure, and is itself ultimately replaced by calcareous substance, the last alteration of which these formations are susceptible. Advanced age favors this degeneration; which, however, is sometimes observed in young subjects, and even in children. Of 100 old persons examined by Rogée, not less than fifty-one had calcareous concretions.

13. *Hypertrophy.*—The lungs are liable to hypertrophy. It is a law of the animal economy that in proportion as a part is exercised so will be its size and strength. This is strikingly exemplified in the muscular system, and also in some of the other organs, as the lungs, testicles, kidneys, and mammæ. Under such circumstances, the organ increases in bulk, its texture becomes more firm and elastic, and the air-cells are enlarged, at the same time that their walls are thickened and strengthened. The augmentation of volume is sometimes extraordinary. I have more than once seen the hypertrophous lung permanently dilate the chest, force down the diaphragm, displace the heart and mediastinum, and project up nearly two inches into the neck between the clavicle and spinal column. In this way, although one lung may be entirely gone, the individual may live for years in tolerable comfort.

14. *Atrophy.*—Atrophy of the lungs, the reverse of the condition just described, is generally produced by accidental circumstances. In great emaciation of the body, such, for example, as is witnessed in protracted fevers, or painful local disorders, the lungs do not seem to participate in the decay, at all events, not to any appreciable extent. That these organs experience some changes in cases of wilful abstinence, when all the other viscera are in a normal state, has been already seen in the chapter on gangrene; but what these changes are, whether they consist in some structural lesion, or in some derangement simply of the nutritive function, has not been determined. In old age, the pulmonary tissue becomes sensibly altered; it no longer possesses the same softness, the same pliancy, or the same color, that it did in youth or adolescence; on the contrary, it is dry, imperfectly elastic, of a pale grayish tint, and comparatively ill supplied with blood. Its absolute bulk and weight are diminished, and the parietes of the air-cells are attenuated and enfeebled.

But these are not the only causes of pulmonary atrophy. In most cases, as was before intimated, it is dependent more immediately upon causes exerting a local influence, and hence it is usually found in association with effusions of water, lymph, pus, or air into the thoracic cavity, or with tumors pressing upon the large bronchial tubes. In such cases, we often find the lung reduced to a mere cake, scarcely more than an inch in thickness, by several inches in diameter, with a dark, dense, inelastic structure, almost devoid of air-cells. This accidental atrophy, which may occur at any period of life, is usually connected, provided the patient survives sufficiently long, with hypertrophy of the opposite lung.

15. *Pulmonary Phthisis.*—By far the most interesting disease of the lungs is phthisis, whether we consider the frequency of its occurrence, the rapidity of its progress, its almost uniform fatality, or the obscurity which still envelops its etiology. This affection essentially consists in a slow disorganization of the pulmonary tissue, occasioned by the development of tubercles.

The opinion now generally prevails that the *primary seat* of tubercular matter is in the air-cells and minute bronchial tubes. That this is true, as a general rule, observation has fully convinced me. Nevertheless, I am far from believing that it is applicable to all cases; for an instance occasionally occurs, where the matter is evidently, in a great measure, if not wholly, confined to the cellular texture. These cases are certainly rare, yet that they really exist, is indisputable. Independently of their easy demonstrability, in this situation, analogy is strongly in favor of the position here contended for. In the kidneys, for example, how often does it happen, that the heterologous bodies are seated exclusively in the so-called cortical tissue, notwithstanding the amount of mucous structure within? They are also frequently seen in the bones, in the substance of adventitious membranes, in the interior of the spleen, and on the surface of the serous membranes, parts which are perfectly devoid of the tissue under consideration. The presence of this tissue is therefore not at all necessary to the production of tubercles, nor is there any reason for concluding that these deposits should be invariably formed by it, even where it abounds in an organ, as it does in the lung.

The *varieties of form* in which this matter is deposited were pointed out in a previous section. Referring the reader to the general history of tubercle, I shall limit myself here to the statement of a few leading facts, which will enable him, it is hoped, more fully to comprehend the character of this lesion.

Of the four varieties of tubercular deposits of the lungs, the *miliary* is by far the most common. It occurs in at least forty-nine out of every fifty cases of phthisis. The individual granules vary in volume between a mustard-seed and a filbert: they are generally of a pale yellowish color, and of a semi-concrete, friable consistence. A grayish hue is not uncommon, especially at first, although it is now a settled point that the deposit may be yellow from the onset and remain so; and, on the other hand, that the gray tubercle may be converted into the yellow, both being merely forms of the same disease: occasionally they have a greenish, vitreous aspect, with a degree of firmness amounting to fibro-cartilage. This is especially the case in that variety of these little bodies to which Bayle has applied the appellation of *gray granulations*, and which this celebrated author considered, though erroneously, to be distinct from genuine tubercles.

In the early stage of their development, the granules, whatever may be their appearance, are always soft and isolated; by and by, however, they augment in consistence, and run into each other, forming thus large nodules, of variable color, size, and shape. Sometimes they contain particles of foreign matter, such as grains of sand, especially in miners, masons, and grinders; and cases occur in which their central portions remain empty, producing an arrangement, when divided, of internal depressions. At other times there is a distinct nucleus of inspissated mucus, around which the tubercular matter is deposited.

The number of miliary tubercles is extremely variable. In some instances, though this is rare, there are a few, perhaps, indeed, only a solitary one; but, in the vast majority of cases, there are hundreds and thousands, of all sizes, from that of a pin-head to that of a hazel-nut. All parts of the lungs are liable to them; but, as will be shown by and by, the superior lobes are their most frequent seat. Occasionally, they are confined to the interior of the organs, the external surface being entirely free from them. This, however, is rare.

These little masses sometimes appear to be *encysted;* but this arrangement is in most instances altogether deceptive, as it probably depends entirely upon the manner in which the tubercular matter is impacted in the bronchial tubes. Such, at any rate, I have found to be the case in my own dissections; for, except on four or five occasions, I have not been able to detect anything like a cyst of new formation.

The *stratiform variety* is also very rare in the lungs; so likewise is the infiltrated. The former I have observed only in a single instance, and then not in the human subject: the latter I have noticed several times, but never to any considerable extent, except in connection with tubercular caverns. The matter, in this form of the disease, may be diffused through several contiguous lobules, an entire lobe, or even the whole lung; generally occupying the air-cells and the minute bronchial tubes, the parietes of which are at the same time somewhat thickened, and preternaturally brittle. Although usually of a yellowish color, it often varies from a light gray to a dark slate, arising from the intermixture of black pulmonary matter, which occasionally imparts to it a variegated marble tint. Its texture is homogeneous, opaque, and of a firm, semi-cartilaginous consistence: when torn, it exhibits a rough, granular surface, and seems to be entirely composed of small, irregular bodies, which, from the peculiarity of their arrangement, have been compared, not inaptly, to the eggs of certain insects, placed in close contact with each other. The tubercular infiltration is originally deposited in detached lozenge-shaped patches, which, in time, coalesce, and so involve a considerable portion of pulmonary tissue: it is most common around old caverns, and is occasionally seen in conjunction with some of the preceding varieties, especially the miliary.

The *pulmonary tissues* around these deposits are variously altered. In the early stages of the disease, before the secretion has made much progress, it is not unusual to find the surrounding parts quite sound. This state, however, rarely continues very long; for, after the tubercles have existed for some time, they invariably act as extraneous bodies, the more so if they are very large or numerous, producing different morbid changes, such as congestion, inflammation, softening, induration, serous infiltration, and the formation of accidental tissues.

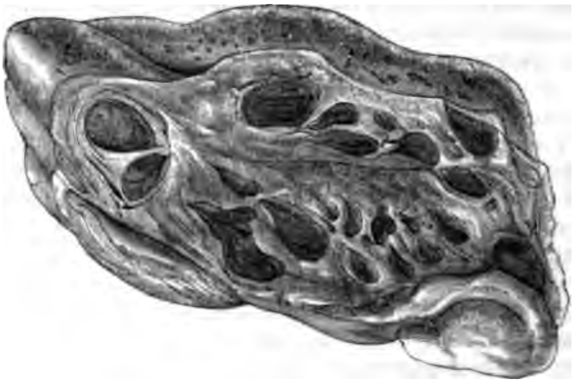
Of these pathological conditions, the most common, perhaps, is congestion, owing probably to the compressed and obstructed state of the pulmonary veins. The blood, being thus prevented from finding a ready outlet, must necessarily accumulate in the capillary vessels around the morbid deposits, which, in consequence, often exhibit quite a red appearance, the vessels being arranged in beautiful arborescent lines, some of which are occasionally traceable into their substance. As the result of this engorged condition, the pulmonary tissues are frequently infiltrated with serous fluid, the quantity being sometimes so considerable as to lead to great embarrassment of breathing, from the want of free admission of air into the lungs. Hæmoptysis is also not uncommon. Pure uncomplicated congestion occurs much oftener, according to my observation, in children and young persons than in the old, or in such as are much exhausted by the disease. If it be allowed to go on unrestrained, it produces, sooner or later, an effusion of lymph, with consequent hardening and shrinking of the pulmonary textures. Softening, gangrene, and ulceration, are also occasionally noticed, but much less frequently, I apprehend, than has been imagined.

The air-cells and minute bronchial tubes, commonly the primary seats of the morbid deposit, are usually more seriously affected than the rest of the anatomical elements of the lungs. Not only are they obliged to bear the brunt of the disease, but, as might be anticipated, they must generally labor under considerable irritation, even for some time before the matter is poured out. Nor is it reasonable to presume that the irritation thus set up will wholly subside during the progress of the secretion. As the matter accumulates in these reservoirs, it presses upon them on all sides, by which, whilst their caliber is enlarged, their parietes are generally attenuated, and finally destroyed by ulcerative absorption. Hence, when caverns form, the bronchial tubes generally open into them abruptly, as if they had been cut across with a sharp instrument. Along with these changes, there is very commonly a red and injected state of the lining membrane, which sometimes extends up into the trachea, and even into the larynx.

After having existed for some time, varying, on an average, from one to nine months, the tubercular matter, whatever may be the form in which it is deposited, manifests a disposition to become soft. The process by which this is effected was pointed out in a previous chapter, to which the reader is referred for an account of it. I shall, therefore, content myself here with a description of the changes which are induced by it in the pulmonary tissues.

Of these changes, the most important is the formation of *excavations*, *caverns*, or *fistulous apertures*. These were formerly considered, under the name of *vomicæ*, to be essential to the condition of phthisis. It is now well known, however, that the disease may prove fatal without them, especially that variety of it which is vulgarly denominated "galloping consumption," and which is marked by great febrile disturbance. In their size, these cavities are very variable; but, as a general rule, it may be said to be in direct ratio to their number. When there is only one, it may be as large as a fist, and capable of holding half a pint of fluid; on the other hand, when they are numerous, they rarely exceed a walnut, and frequently they are not larger than a hazelnut, an almond, or a pigeon's egg. In their shape, they are for the most part irregularly rounded, sometimes ovoidal, and occasionally angular. In respect to their number, not less than in regard to their size and shape, much diversity obtains. It is seldom that there are more than two or three, yet, in some instances, the number is extraordinary. Not long ago, I examined the body of an old man, sixty-two years of age, whose right lung was literally one continuous chain of excavations, the largest of which was scarcely as large as a billiard-ball. Upwards of forty were counted. Many communicated together by short, fistulous tracks, and nearly one-half of them were completely empty.

Fig. 148.



Pulmonary caverns. From a preparation in my collection.

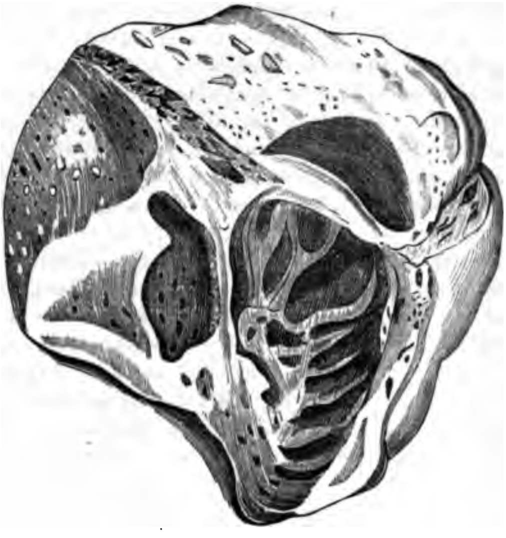
The largest excavations are almost always found in the superior lobes, inasmuch as the softening process usually proceeds there to a much greater extent than elsewhere. It also, for the most part, commences at this situation. Hence nothing is more common, in making examinations, than to meet with caverns in the summits of the lungs, with half-softened tubercles further down, and with crude tubercles and sound pulmonary substance at the base of these organs. In the majority of cases, the cavities occur in both lungs. In children they are generally much smaller, as well as much less numerous, than in adults, and they rarely exist simultaneously in both organs. They are, moreover, commonly seated in the middle or lower lobes, instead of in the upper, as in adults.

When recent, the *walls* of the excavations are soft, and lined by a thin layer of lymph, which is easily separated from the surrounding parts: in more protracted instances, the false membrane is dense, grayish, sometimes fibro-cartilaginous, and from one-fourth to one-third of a line thick. Occasionally several lamellæ are thus deposited, the one last formed being always more delicate, more easily torn, and of a more yellowish color. In some instances, the excavation is entirely destitute of a lining membrane, the parietes being formed by indurated pulmonary tissue, having a raw, fleshy appearance, not unlike the surface of a granulating ulcer.

The *contents* of these cavities vary, according to their age. Such as are recent generally contain thick, cream-colored, inodorous matter, like common pus; whilst, in those of long standing, the fluid is of a thin, bloody, sanious character, and often quite offensive. Cretaceous matter is also sometimes found in them, and occasionally a substance resembling fibro-cartilage. It is only in recent cases, and then very seldom, that the excavations contain fragments of pulmonary tissue. The period required for emptying themselves varies from a few weeks to several months, according to the size of the tubercular mass, the extent of the local disease, and the state of the system.

It is very seldom that we find the older caverns perfectly smooth internally; their surface is almost always ragged and uneven, and the irregularity is apt to be still further increased by their being intersected in different directions by small cord-like bodies, consisting either of condensed cellular substance, or of impervious vessels. (See Fig. 149.) In their shape, these little bundles bear a very close resemblance to the fleshy columns of the heart; their length is variable; in thickness, they are from one to two lines; they are thinner at the middle than at the extremities; and they are usually incrusted with tubercular matter. It is singular that these excavations seldom, if ever, contain any remains of the bronchial tubes. The pressure that is exerted upon these structures by the tubercular matter, both internally and externally, seems to be sufficient to produce their speedy destruction; and hence it is extremely rare to find the slightest relic of them, even where the cavern is only partially evacuated, or the heterologous deposit only slightly softened. Nor does the cavity always communicate with the air-passages. In some instances—and these are not unfrequent—it is completely closed, so that its contents, being unable to find their way out, either remain, or are finally absorbed.

Fig. 149.



Pulmonary caverns intersected by cord-like bodies. From a specimen in my cabinet.

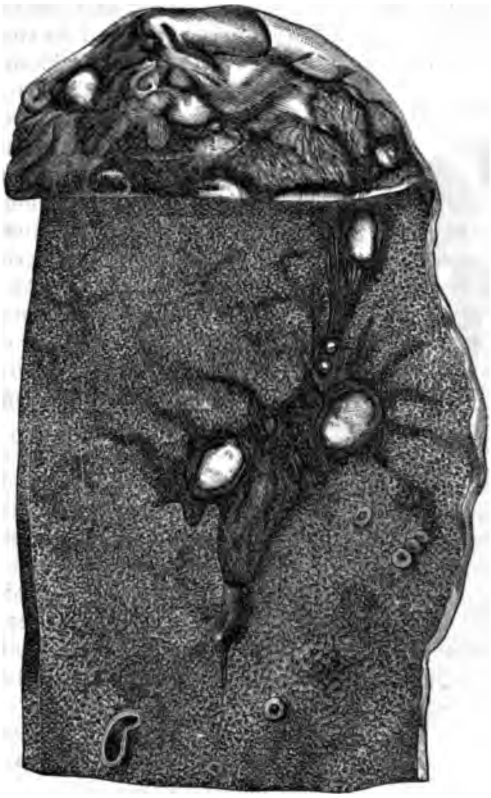
More commonly, however, one or more bronchial tubes open directly into it, and thus serve to carry off whatever may be lodged within. Occasionally the matter escapes into the pleuritic sac, where, in a short time, it excites fatal inflammation. The late Dr. Morton, of this city, describes an interesting case, where the cavern, which was encysted, and situated in the apex of the right lung, communicated, by a fistulous opening, with a large abscess in the back.

It has been already stated that tubercular caverns are often intersected by small *vascular cords*, the vestiges, evidently, of the arterial and venous branches that supplied the affected structure. The changes which these vessels undergo, in such cases, are exceedingly interesting. Long before the softening begins, their caliber is obliterated, as if nature, intent on preventing hemorrhage, took care to anticipate the ulcerative process. In the early stage of the disease, the vessels are merely forced aside, and compressed by the tubercular matter; but as the deposition advances, they gradually become impervious, and are at length converted into hard, fibrous cords, like the umbilical vessels of the infant after parturition. Thus affected, they are greatly diminished in volume, and no longer admit the finest injecting matter; even air cannot be made to pass along them; in a word, they are completely, effectually, permanently obliterated. But for this provision, which is as wonderful as it is beneficent, few individuals would survive the softening process. As it is, with all the care that nature can exert, fatal hemorrhage is unfortunately of too frequent occurrence, arising from the rupture of the affected vessel, in consequence of the inability of its walls to withstand the shock of the circulating fluid. The blood occasionally finds its way from the cavern by a fistulous opening into the œsophagus, or some of the neighboring parts.

Owing to the crippled and embarrassed condition of the branches of the pulmonary artery, above alluded to, nature is not slow in establishing a supplementary circulation, to compensate for the defects of the old. The new vessels appear as red lines, which taper off at each end, and are scarcely a millimetre in diameter; their parietes are extremely delicate, and they are at first perfectly isolated, but in time they assume a retiform arrangement, and communicate not only with each other, but likewise with the bronchial arteries, or with those of the walls of the thorax. The latter connection is effected by means of new vessels developed in the false membranes of the pleura. The amount of vascularization established in this manner increases in proportion to the amount of the tubercular deposit; it pervades the whole of the affected lung, and serves as a substitute for the obliterated branches of the pulmonary artery. How far these new vessels, which may frequently be rendered remarkably distinct by artificial injection, contribute to the vitality of the heteroclite deposit, is unknown. It has been maintained that they are specially created for its nutrition, and the promotion of its growth; an opinion which is, to say the least, highly plausible. This, however, if it be one of the uses of this supplementary circulation, is not the only one. Another, and perhaps still more important office, is the influence which it exerts upon the oxygenation of the blood, which is distributed to it by the aorta through the bronchial arteries, and which is returned to the heart by the bronchial, pulmonary, and azygos veins.

One of the most interesting facts, in relation to these caverns, is, that they are susceptible of *cicatrization*. That this occurrence is rare, common sense alone, unaided by observation, is sufficient to convince us; but that it occasionally takes place has been abundantly proved by pathological researches. There are three modes in which this process may be effected, each of which is deserving of brief notice. In one, which is by far the most common, the cavern remains open, and its surface becomes lined with a thin layer of lymph: this adheres more or less strongly to the surrounding textures, is gradually organized, and finally converted into a membrane, which possesses all the properties of the mucous tissue, excepting that it is devoid of mucous glands, and therefore incapable of secreting genuine mucous

Fig. 150.

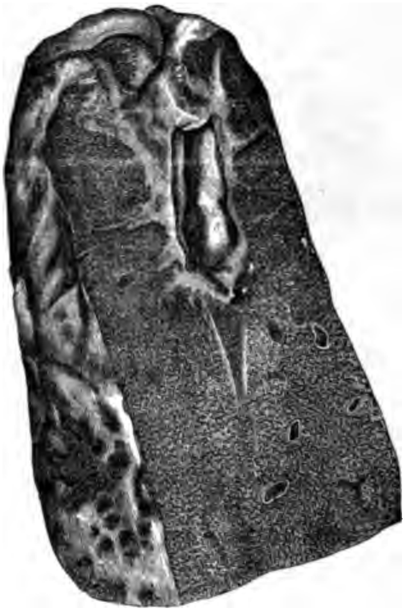


The section of a lung seen from within, the apex having been left entire to show the deep puckerings which covered its surface. The line of the healed cavity is densely loaded with black carbonaceous deposit, in which are seen five cretaceous concretions, three of them encysted. This preparation is, perhaps, a unique specimen, proving the healing, by cicatrization, of an enormous tubercular excavation in the lung. Natural size.—After Bennett.

matter. Secondly, the cicatrization may be effected by the contraction of the excavation, and the slow but steady agglutination of its sides, through the intervention of dense cellular substance of new formation. Thirdly, it may take place by an effusion of lymph, or by repeated deposits on the inner surface of the cavity, forming a white bluish mass, more or less dense in its structure, in which the bronchial tubes may be seen abruptly terminating. In the last two varieties of cicatrization, the contraction of the accidental tissue gives rise to a puckering of the lung, which is most distinctly marked when the serous envelop of the organ is forced to follow the retrocession of the parenchymatous substance. These scars—for thus they may be called—are most common in the apex of the lung; and they may be of various figures, as oval, circular, linear, arborescent or stellated

Appearances similar to these may be produced by the deposition of fibrin upon the pulmonary pleura. In acute inflammation of the serous membrane of the chest, there is generally an effusion not only of this substance but also of serosity, either simultaneously or successively. Should the serosity be poured out first, it will have the effect of compressing the lung and of preventing adhesion between the pulmonary and costal pleura. As the effused matter is absorbed, the organ gradually expands, and ultimately regains its original form, volume, and situation. If, however, while the lung is in this position, a layer of fibrin be deposited upon its surface, it will be liable to be permanently compressed, and at length, owing to the contraction of the new substance, exhibit the depressed, corrugated, puckered, or mammillated appearance, so often mistaken for the cicatrice of a tubercular excavation, and as an evidence of the cure of pulmonary phthisis.

Fig. 151.



Internal section of the summit of the left lung showing the stellate puckering at the apex, and another lower down. Corresponding with the former may be seen a cavity the size of an almond, in process of contraction, and surrounded by dense fibrous radii. Natural size.—From BENNETT.

Although tubercles generally coexist in both lungs, yet the left of these organs is commonly more extensively involved than the right. In 86 cases, analyzed by Dr. Morton, of this city, both lungs were equally affected in 7, the left most in 51, and the right in 28. In 250 cases reported by Dr. H. M. Hughes, the left lung was chiefly affected in 116, and the right in 89, the more diseased side being doubtful in the remaining 45. These conclusions are fully sustained by the results of my own dissections. With the exception of twelve or fifteen cases, I have invariably found the left organ more extensively implicated than the right. In a few instances, the heteroclite deposit is confined to one side. Upon what the difference here referred to depends, is a point which has not been satisfactorily explained.

The morbid deposit is almost constantly more copious and perfect at the summit than at the base of the lungs. So true is this, that it may be laid down as a rule, scarcely liable to a single exception.[1] Various explanations, all, however, of a conjectural character, have been offered with a view of accounting for this phenomenon. It is highly probable that the confined and compressed state of the superior lobes of the respiratory organs exerts an injurious influence, in predisposing these parts to disease; but the real and efficient cause, doubtless, is a diminished supply of blood, and a consequent debility of the parts under notice. Owing to our erect position, the circulation here is carried on with difficulty; the pulmonary tissues are imperfectly nourished; the proper stimulus resulting from the due admission of the sanguineous fluid is withheld; and hence, whenever any cause exists that has a tendency to produce tubercular disease, it generally exerts its baneful effects upon this particular portion of the organ, in preference to others that are more directly under the control of the sanguiferous and nervous systems. This conjecture—for we claim for it nothing else—receives support from the fact, now well established, that, in quadrupeds, the dorsal portion of the lung, which, in reference to the effect of gravitation, may be said to correspond to the apex of the human lung, is generally more extensively tubercularized than the rest of the viscus.

Louis, as has been stated elsewhere, has ascertained, from a careful examination of 358 cases, of which 127 died of phthisis, that tubercles rarely, if ever, occur in any organ in the body after the fifteenth year, unless they also exist in the lungs. These results have been verified by other observers, and may therefore be regarded as constituting an important law. It has been further ascertained that tubercles are more diffused, and are of more frequent occurrence in other viscera, without affecting the pulmonary tissues, in infancy than in adult age.

*Sex* appears to exercise a considerable influence on the production of phthisis. According to Louis, women are more prone to it than men, in the proportion nearly of nine to seven. This conclusion of the French author is fully confirmed by the researches of several of his countrymen. Chateauneuf states that, out of 1544 deaths from pulmonary consumption, 745 were men, 807 women. In the statistical tables of Paris, published under the auspices of Charbol, in 1830, we find that, out of 9542 cases of this disease, 5582 were females, 3960 males. Upon this subject my own experience is too limited to enable me to speak positively; yet, so far as it goes, it is decidedly in favor of the greater predominance of this disease in men than in women, being quite certain that I have examined the bodies of five of the former to one of the latter. It is altogether probable that the mortality from this cause varies in the two sexes in different regions. This, indeed, is rendered almost certain by the calculations of Dr. Clark, as stated in his treatise on consumption.[1] Thus, for example, in New York, the proportion of males to females, in round numbers, is as ten to eight; in Berlin, as ten to eleven; and, at Edinburgh, as ten to six.[2] In Sweden, the proportion is nearly equal. In Prussia, if Berlin may be taken as an illustration, phthisis in childhood appears to be much more common among females than among males.

---

[1] Of the two hundred and fifty cases, reported by Dr. Hughes, the upper lobe of one or both lungs was solely or principally diseased in two hundred and thirty-seven. Of the thirteen remaining cases, of which eleven occurred in males, and only two in females, there were nine, or three and three-fifths per cent. of the entire number, in which both lungs were universally and uniformly affected.

The period of life most liable to phthisis is between twenty and forty. This fact, which was pointed out by Hippocrates, has been amply confirmed by the united experience of modern physicians. It has been ascertained that children are most prone to tubercles between the ages of three and six, inclusive. We have no correct data for estimating the frequency of phthisis immediately under and above this period, but the number of deaths is considerable. Infants are sometimes born with this disease. Of this occurrence, several well-authenticated cases are now on record; that they are uncommon, cannot be doubted; and, thus far, it has not fallen to my lot to meet with them. I have, however, in several instances observed tubercles in very young children; and similar observations have been made by some of my friends. The *duration* of phthisis varies from a few weeks to several years, the average being about nine months.

Is the popular notion that phthisis is *contagious*, well founded? This question has often been answered affirmatively, but never, at least so far as I know, in a single instance upon satisfactory evidence. Morgagni was so fully impressed with the idea that the disease is contagious, that he very rarely examined a person that died of it, for fear, as he says, of contracting the infection. Professor Andral, in his commentaries on the treatise of Laennec, without attempting to decide the point at issue, thinks it ought not to be treated too lightly, alleging that it is by no means easy, in the present state of our knowledge, to give a positive opinion concerning it. Upon this subject I have no personal experience, yet I cannot but believe that the notion about the contagiousness of phthisis is perfectly idle and ill-founded. If, as sometimes happens, the nurses and friends of consumptive patients contract the disease, the circumstance is surely explicable upon other and more philosophical grounds. Loss of sleep, and anxiety of mind, with the attendant impairment of the digestive function, are amongst the most powerful predisposing causes of the disease, and are alone sufficient, in many instances, to kindle it into action. Strong, though not conclusive testimony in favor of the non-contagious character of phthisis is likewise afforded by the experiments of Hébrèard and Lepelletier, of France. These physicians inoculated different animals with pus taken from scrofulous ulcers, without, in a single instance, inducing the disease, or even any particular local derangement. The latter even tried the effects of the matter upon himself, but with no better success. Children have also been inoculated with impunity. Taking all these circumstances into consideration, there is not even a shadow of proof that consumption is contagious. Nevertheless, more extensive and diversified observation is necessary before we can pronounce positively on the subject.

---

[1] London edition, p. 183.

[2] See Dr. Home's Report, Edinburgh Med. and Surg. Journal, No. 134.

It rarely happens that consumptive patients reach the goal of their existence, without other organs than the lungs becoming seriously involved in the disease. The affections which thus complicate the thoracic lesion may be purely accidental; that is, they may supervene during the progress of the complaint without having any direct connection with it; but in general they are to be viewed in the light of cause and effect, the presence of the one being necessary to that of the other.

The *pleura* is very rarely free from disease. Indeed, this can only be the case so long as the tubercles are few, small, and confined to the interior of the pulmonary tissue; for, as soon as they become numerous, large, and affect the exterior of the organ, they must necessarily act as irritants, and thus lead to structural derangement of the serous investment. Hence we generally find extensive adhesions, both interlobular, costal, diaphragmatic, and even pericardiac. The intervening substance varies in its consistence from that of recent lymph to that of fibro-cartilage, according to the period of its existence. Generally it is pretty thick, and of the nature of cellular tissue, being harder and firmer in some places than in others. When there are large excavations, there are almost always extensive adhesions; tubercles are sometimes disseminated through the false membranes; and, during the latter stages of the disease, the morbid deposit is often accompanied by effusions of serous fluid, the quantity of which varies from a few ounces to several pints. This secretion, there is reason to believe, frequently takes place only a day or two before death. It need scarcely be remarked that, as the superior lobes are usually most affected with tubercles, so they generally adhere most firmly to the walls of the chest.

One of the most distressing accidents which occur during the progress of phthisis, is *perforation* of the pleura. This usually takes place suddenly, in the advanced stage of the disease, and almost always destroys life within the first few days, from the violent inflammation that is excited by the extravasation of acrid fluids and the entrance of the atmosphere.

The *air-passages* are variously affected in phthisis. The ramifications of the bronchiæ are, as before stated, frequently obliterated, very much contracted, or otherwise altered in their form and dimensions. The mucous membrane of the principal tubes, as well as that of the smaller ones, is generally reddened, opaque and thickened; occasionally softened, incrusted with specks of lymph, or even ulcerated. Appearances nearly similar are often seen in the trachea; and here it is also more common to find erosions. Occasionally there is extensive destruction of the mucous membrane, with great thickening of the muscular fibres; and, in rare cases, the ulcerative action has been known to produce serious mischief in the cartilaginous rings. The larynx and epiglottis are also frequently studded with ulcers.

That the *heart* should be affected in pulmonary consumption, is no more than what might be expected, from its close proximity to the lungs; yet that this does not so often happen as has been imagined, my dissections warrant me in saying. Even in protracted cases, I have frequently been unable, notwithstanding the closest scrutiny, to detect anything more than a pallid and slightly softened state of the muscular fibres, with an entire absorption of adipose matter. In the great majority of persons examined by Louis, the organ is stated to have been unusually small, being not more than two-thirds of the normal volume. The most common lesion which I have noticed was hypertrophy of the ventricles; and, what is remarkable, this was generally more frequent, as well as more perfectly marked, on the left side than on the right. Occasionally, also, I have observed a diseased state of the mitral and aortic valves; in some of my examinations there were numerous flakes of lymph, with partial adhesions of the pericardium, the result evidently of recent inflammation of its serous investment. In a few cases, the pericardium was distended, and pushed out of place by an immense quantity of sero-albuminous matter. The large vessels attached to the heart are usually healthy.

The most common appearance observed in the *peritoneum* is sero-albuminous fluid, which is always most copious when there is coetaneous disease of the spleen, liver, heart, or mesenteric glands. The phenomenon, however, is extremly rare. The membrane is sometimes thickened, opaque, discolored, or studded with tubercles in various stages of maturation. A small quantity of thick, cream-colored matter is occasionally found, not unlike what occurs in phlegmonous abscesses.

The *spleen*, in phthisis, is seldom much involved. Tubercles are occasionally noticed, but with no regularity as to relative frequency. From never having found these bodies in persons who died of other diseases, Louis is disposed to consider them as peculiar to this affection; a conclusion decidedly at variance with my own observations. I have in four cases, at least, seen this state of the spleen unconnected with phthisis. An alteration of volume and consistence is by no means unfrequent; but whether these pathological conditions are foreign to, or dependent upon, the present affection, is a point which remains to be settled.

The *liver* is variously affected. The most frequent alteration, perhaps, is the fatty degeneration, though in my own dissections I have found cirrhosis most common. The waxy degeneration, which is probably only an advanced stage of the adipose, and in which the organ acquires a brownish, yellowish color, with a strong resinous lustre, a dense but friable consistence, and a homogeneous aspect, I have never noticed, in a single instance, as a complication of the present disease. The hepatic tissue is sometimes extensively softened; at other times, it is preternaturally firm; whilst, in a third series of cases, though these are very rare, it contains tubercular deposits, serous cysts, hydatids, or other morbid growths. With these various alterations, the volume of the liver may be natural, augmented, or diminished. The former I believe to be the most common. The gall-bladder is ordinarily exempt from disease.

The *pancreas* is rarely affected in phthisis. I have found tubercles in it only in a single case, that of a negro boy nine years old.

During the latter stages of phthisis, aphthæ are very apt to appear in the *mouth.* They are generally considered as the immediate forerunners of dissolution; sometimes, however, they exist a considerable time before this occurrence. In general, they are extremely numerous, covering both the tongue, the inside of the cheeks, and the fauces. Occasionally, though rarely, they are also observed in the nose and ears, and even on the vulva. When first seen, they present the appearance of minute chalk-colored specks, resting upon a red florid base. By and by these white crusts fall off, exposing a great number of small ulcers, the primary seat of which is in the muciparous glands. The suffering caused by these aphthæ is sometimes intense. The pharynx and œsophagus are rarely affected in phthisis.

The *stomach* often sympathizes with the disorganization of the lungs. One of the most common lesions is softening, with diminished thickness of the mucous coat. These changes are sometimes produced after death by the action of the gastric juice; but more frequently they are caused by inflammatory irritation, and are usually most conspicuous along the great cul-de-sac of the organ. The mucous membrane is occasionally ulcerated, thickened, extensively reddened, or mammillated. Another lesion sometimes met with is a dilated condition of the stomach, along with a blanched and attenuated state of its different tunics.

But of all the organs there is none which is so frequently or so extensively affected in phthisis as the *intestinal tube.* The parts more particularly liable to suffer are the inferior third of the ileum, the cæcum, and the ascending portion of the colon. The most common lesions here, by far, are ulcerations; indeed, it is rare that we examine a subject in which they do not occur in considerable numbers. In the small bowel they are usually situated over the Peyerian glands, which they sometimes entirely destroy, forming large, ragged ulcers, resting upon the muscular fibres. In the large intestine, the erosions occur irregularly, and seldom attain a great size, except when several of them coalesce. The subjoined table, compiled from different sources, will place this subject in a more tangible attitude:—

| Authors. | No. of Patients. | Locality. | Small Intestine. | Large do. |
|---|---|---|---|---|
| Bayle[1] | 200 | Paris | 67 | |
| Louis[2] | 112 | " | 78 | 70 |
| Home[3] | 66 | Edinburgh | 30 | 38 |

Tubercles are likewise common, and there is every reason to believe that they always precede the intestinal ulcerations. They are usually situated in the submucous cellular substance, where they are sometimes seen in great numbers, either isolated or grouped together.

---

[1] Recherches sur la Phthisie Pulmonaire, p. 59.

[2] Louis, op. cit., p. 81.

[3] Report on Phthisis, op cit., p. 28.

It is a common opinion that phthisis frequently gives rise to *anal fistule*, establishing thus, as it were, a sort of an issue, which, by diverting from the affected organ, retards, as is supposed, the progress of the original malady. Respectable as the authority certainly is by which this notion is sanctioned, it is at variance with general experience. The circumstance, I am convinced, is, in great measure, if not wholly, accidental; at any rate, I can truly aver that it has rarely occurred in my practice, nor have I witnessed it more than three or four times in my dissections of phthisical subjects. The disease is evidently the result, in every case of this kind, of tubercular disease of the lower bowel.

It is seldom that we find the *urinary* and *genital organs* much affected in this disease. In a few instances, I have observed tubercles in the kidneys, ovaries, prostate gland, and seminal vesicles. The uterus is almost invariably sound. On two occasions I have met with ulcers in the urinary bladder, and on one with a small deposit of tubercular matter in the submucous cellular tissue.

Phthisis does not often run its course without some of the *lymphatic ganglions* becoming diseased. Those of the mesentery, bronchiæ, and pelvis, appear to be much oftener affected than those of any other region; yet the cervical and axillary are also not unfrequently found in a disordered state. The most common lesion is the tubercular deposit, which is generally conjoined with hypertrophy, induration, and vascular engorgement. In adults, according to my observations, this heterologous formation is most frequent in the bronchial ganglions; in children and young persons, in the mesenteric, meso-cœcal, and meso-colic.

The *brain* and its envelops are found in various diseased states. Sometimes there is unnatural vascularity of the cerebral pulp, accompanied occasionally with softening of the fornix and great commissure. Tubercles are also observed in different situations, either solitary in some part of the encephalic mass, or spread generally over the arachnoid membrane, which is not unfrequently opaque and thickened. In many cases there is effusion of limpid fluid, either in the ventricles, or between the arachnoid and pia mater, at the base or top of the brain. This effusion probably takes place, in most instances, only a short time before death, inasmuch as the intellectual faculties generally remain unimpaired until within a few hours of dissolution.

From the foregoing account it is obvious that the diseases which complicate phthisis are both numerous and distressing. That they are more common in some localities than in others is highly probable; but further researches are needed before we can deduce any satisfactory conclusions in regard to this and some other topics. In the mean time, all our necroscopic examinations should be conducted with the utmost scrutiny, taking care not to overlook a single organ, however distantly it may be connected by structure and sympathy with the suffering viscera; for in this way alone can we hope to add anything substantial to the pathological anatomy of phthisis.

Much variety obtains with regard to the color, quantity, and consistence of the *expectorated matter*. In the early stage of phthisis, there is either an entire absence of fluid, or it is remarkably scanty, thin, and spumous. At a later period, the quantity considerably increases; but it still retains the whitish, semi-transparent appearance of the bronchial secretion. These characters are observable until softening takes place, and caverns begin to form, when the sputa become streaked with opaque specks, from the admixture of broken down tubercular matter, and are ejected in distinct, rounded masses, with irregular and indented edges. The color of these masses is somewhat yellowish, with various shades of ash, and even green: they sink, in part, in water, and they are generally enveloped by a thin, ropy, and more transparent fluid, which is nothing but common bronchial mucus. In the closing stage of the malady, the sputa assume a dirty, cineritious aspect; they are much more tenacious, and they usually run together. The quantity of matter expectorated varies remarkably in different instances, and is seldom commensurate with the extent of the pulmonary lesion. In rapid cases, from ten to twenty ounces are sometimes discharged in the course of twenty-four hours, even before the disease has made much progress. Occasionally the matter is ejected suddenly in large quantities, as when a tubercular abscess gives way; and, under such circumstances, the patient has been known to be suffocated by it, from his inability to clear the bronchial tubes.

The sputa, especially in the latter stages of the complaint, have generally a nauseous odor, and are at times quite fetid. Their taste is variable; very often they are quite insipid; at other times they are saccharine, and, in a few rare cases, saline. Fragments of pulmonary parenchyma, bronchial tubes, and false membrane, similar to that of croup, are sometimes mixed with the ejected matter; and occasionally, though this is also extremely rare, the patient coughs up small calculous concretions. The sources of the expectorated fluid are three, the bronchial mucous membrane, softened tubercles, and excavations.

*Hæmoptysis* is a frequent occurrence. It may take place at any period of the disease, but is most common during the early stages. Age and sex appear to exert a considerable influence upon its production. Females are more liable to it than males, the former being more commonly attacked after the age of forty, whilst the latter seem to be equally subject to it before and after that period. It is very rare in infants and children. The quantity of blood varies in different cases, from half an ounce to a pint or more; in some instances, it merely streaks the sputa, and in others it comes away in large mouthfuls. I recollect a case in which upwards of a gallon was discharged in the course of a few hours. The hemorrhage in this instance, as in almost every other where it is profuse, proceeded from an opening of one of the branches of the pulmonary artery, which had traversed a large excavation in the superior lobe of the right lung. When less copious, besides the source just mentioned, the blood may be furnished, first, by the bronchial mucous membrane; secondly, by the air-cells; and, thirdly, by the parietes of tubercular caverns, the surface of which, as was before intimated, is occasionally thickly studded with minute vascular granulations. The blood of hæmoptysis is commonly florid; occasionally it is dark and clotted; and at times it is mixed with frothy, mucous, or purulent matter.

---

## SECTION III.

### DISEASES OF THE PLEURA.

Inflammation of the pleura may be acute or chronic; it may be limited to a small portion of the membrane, or pervade its whole surface. Occasionally, too, though this is unusual, it attacks both sacs simultaneously. When the inflammation affects the pulmonary pleura, it generally extends to the parenchymatous structure of the lung, constituting what is called pleuro-pneumonia.

*Acute Pleuritis and its Effects.*—The anatomical characters of acute pleuritis consist in a change of color of the affected membrane, with an increase of its secretion, an altered state of the subserous cellular tissue, and a change in the form and volume of the lung, invested by the inflamed texture.

As soon as the pleura is irritated, the subjacent capillary vessels become injected with red blood, and spread out in every possible direction, anastomosing freely with each other. In this way they form, at first, beautiful dendritic lines, and afterwards, as the disease progresses, a close and intricate meshwork, the intervals of which are often much smaller than the most delicate pin-head. The color produced by this capillary injection is usually a bright red; and, although it generally occurs in small patches, with sound portions intervening, yet, in many instances, it is diffused over a considerable extent of surface, occupying the greater part of the entire membrane. In very mild cases we have sometimes the speckled, dotted, or punctiform redness; as, in those of an opposite character, we sometimes have the blotched, ecchymotic, or bloodshot appearance. In the early stage of the disease, the capillary vessels upon which this discoloration depends, seem to be confined to the subjacent fascia; but, as the inflammation advances to completion, they extend into the substance of the pleura, as we may convince ourselves by peeling off this membrane, and inspecting it with the aid of a good glass, or simply by holding it between the eye and the light.

In most cases of acute pleuritis, there is an effusion of serosity into the subserous cellular texture, which may be so great as to give the affected membrane an œdematous aspect. This infiltration, which usually begins at a very early stage of the disease, is always more abundant under the pulmonary than under the costal or diaphragmatic pleura, from the more considerable laxness of the connecting tissue. The serous membrane itself is not at all thickened, though the contrary, I know, has been asserted by numerous pathologists.

In acute pleuritis, as in the corresponding disease of the arachnoid, pericardium, and peritoneum, there usually occurs, in the nascent stage of the complaint, if not an entire suppression, at least a considerable diminution of the natural secretion; so that the membrane, instead of being moist and lubricated, as in the normal state, is rendered somewhat dry and harsh. But this state continues only for a very short period, when it is followed by an effusion of serum and lymph.

The quantity of serum poured out in this affection varies from a few drachms to several quarts. Generally thin, watery, and colorless, it is sometimes reddish, and slightly flocculent; or it resembles unclarified whey, and contains masses of lymph, pus, or blood. Occasionally, the fluid is of a yellowish, viscid character, not unlike copal varnish or thin olive oil. An exhalation of pure blood is sometimes witnessed; but this is much more infrequent than in acute pericarditis, or in acute inflammation of the serous membrane of the abdomen.

It is very seldom that genuine pus is secreted in this disease, and yet such cases sometimes take place, and that with very great rapidity. In the winter of 1837, two cases occurred to me, one in a boy nine years old, and the other in a child of ten months, in both of which upwards of a pint of thick cream-colored matter was found in the pleural cavity after an illness of only about two weeks.

Concurrently with this effusion of serosity, there is a deposition of lymph, either in small globules, in patches, or in continuous layers. At first, this substance is quite soft, so that it can be easily scraped off with the finger nail: but, after it has existed for a few days, it is found to have a considerable degree of tenacity, and to exhibit the usual manifestations of incipient organization. The precise period at which this process begins cannot be satisfactorily indicated, as it must vary in different cases; as a general proposition, it may be affirmed to be from forty-eight to seventy-two hours from the invasion of the disease. The color of the deposition is usually a pale straw, but not unfrequently it is a milk-white, light gray, or reddish, from the admixture of blood.

If the inflammation be early arrested, the effused serum is gradually absorbed, and the contiguous surfaces of the affected membrane, now only covered with lymph, are speedily cemented together. The adhesions thus formed are, at first, very slight and easily broken; but in process of time, they are converted into cellular tissue, and become proportionally strong and resisting. When extensive, they often greatly embarrass the movements of the lungs, at the same time that they exert a very serious influence upon the size and figure of the chest.

It deserves to be mentioned that, when the quantity of fluid is considerable, the adventitious membranes are apt to be quite thick, and to have their outer surface pitted like a honeycomb. Of the manner in which the lung is affected in this disease, mention will be made under the head of chronic pleuritis.

*Gangrene* is one of the rarest results of acute pleuritis. Most commonly it is produced by external violence, and occasionally it is propagated from the pulmonary tissue. The affected parts may be readily distinguished by their softened, pulpy condition, by their dark grayish, brownish, or blackish color, and by their disagreeable fetid odor. In some instances, the affection appears to begin in the adventitious membranes, from whence it gradually spreads to the other structures, as the pleura, the lungs, intercostal muscles, and even the ribs.

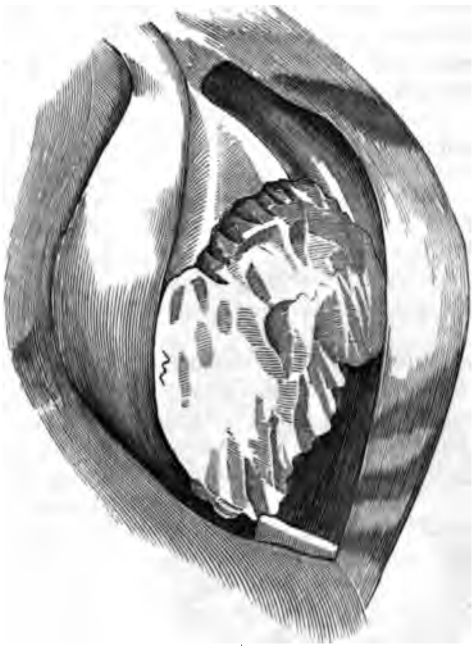
*Chronic Pleuritis and its Effects.*—When acute inflammation of the serous membrane of the chest continues beyond a few weeks, it becomes chronic; but it is by no means always thus preceded: for, in many instances, it exists as an original affection, stealing on in a slow and almost insensible manner. In whatever way, however, it may arise, the anatomical characters do not differ essentially in the two diseases, especially as far as the effusions are concerned.

In chronic pleuritis, the membrane acquires a slight degree of morbid thickening, its color is of a more obscure red, and the subserous cellular tissue is hypertrophied and indurated. This, however, is not always the case; for, in some instances I have found this substance so soft and brittle that the pleura could be peeled off, almost entire, with the utmost facility. The effusion, which is generally much more abundant, as well as more turbid, than in the acute disease, is almost always mixed with lymph. Hence, when evacuated, and allowed to stand at rest, it usually separates into two parts; one thin and viscid, like serum, floating on the top; the other, which consists of fragments of albumen and serum, sinking to the bottom. Most commonly, perhaps, the effusion is of a light lemon color, of the consistence of thin oil, and destitute, or nearly so, of odor. Frequently, however, it is of a dark greenish hue, sero-purulent, and almost insupportably offensive. Cases also occur in which it contains blood, and now and then it is strictly purulent, possessing all the properties of genuine pus. The quantity of effused fluid is sometimes almost incredible. In a subject, fifty-two years old, I drew off, not long ago, fully two gallons of sero-purulent matter, from the right pleural sac: it was of a white yellowish color, and intolerably offensive. Occasionally, when the distension is very great, the fluid has a tendency to escape, either through the bronchial tubes, through the intercostal spaces, or even through the diaphragm. When the patient survives, as sometimes happens, the passage along which the pus travels is lined with an adventitious membrane, like fistulous tracks in other parts of the body.

The adventitious membranes of chronic pleuritis do not materially differ from those produced by the acute form of the disease, excepting that they are generally thicker, more extensive, denser, and more firm. They often consist of a number of distinct layers, the outer of which are always much softer than the internal, or those which are formed first. I have repeatedly seen from three to five such lamellæ; and it has sometimes occurred to me to meet with small compartments, formed by sheets of lymph, and filled with a thin, glairy fluid, not unlike the white of egg. Occasionally these cavities contain thick pus, and even pure blood. When these false membranes are fully developed, they become subject to the same diseases as the natural tissues; as the different effusions, gangrene, tubercles, and, lastly, the fibrous, cartilaginous, and osseous transformations. Their vascularity is sometimes very considerable, as is shown by the red dots upon their free surface, as well as by the hemorrhagic clots in their cavities. Thus, then, it is sufficiently clear, from what has been stated, that these adventitious structures perform the office of secretion; and, from the fact that the effused fluids sometimes entirely disappear, it is equally manifest that they also possess the faculty of absorption.

Portions of these false membranes are sometimes converted into cysts, filled with tubercular matter. This was the case with a man, thirty-three years of age, whose body I examined in 1844. His death was occasioned by pulmonary phthisis. On the convex part of the right lung, at the junction of the middle and inferior lobes, was a strong, white bag, of an elongated oval shape, two inches and a half in length, by one inch and three-quarters in width; it fluctuated under the finger, and was occupied by soft yellowish tubercular matter. Of a dense fibrous structure, it was about half a line thick, and adhered with great firmness to the outer surface of the pleura. The parts immediately around it had a remarkably puckered aspect, and were traversed by numerous vessels, some of which extended into the abnormal pouch. Fig. 152 represents the cyst with a portion of its contents exposed by incision.

Fig. 152.



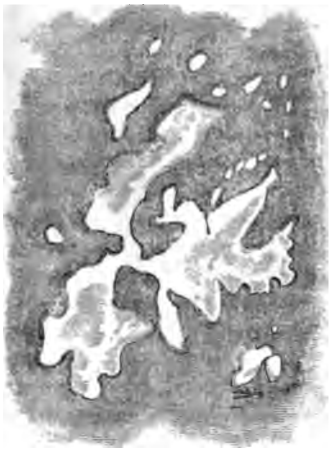
False membrane of the pleura formed into a sac filled with tubercular matter. From a preparation in my collection.

Small bony *concretions*, very much like those of the joints, are sometimes found floating loosely about in pleuritic effusions. How these bodies originate has long been a problem with pathologists; the most plausible explanation, perhaps, is that they are attached, at first, to the surface of the pleura, in the form of fibrin; secondly, that they are organized; thirdly, that their nutrition being perverted, bony matter is deposited; and, fourthly, that, after this process has continued for some length of time, the vessels supplying them are oblitered, in consequence of which they drop off. Instead of being osseous, these concretions may be of a fibrous, fibro-cartilaginous, or gristly consistence, and of a white pearly colour, with a tolerably smooth surface.

*Gases* sometimes accumulate in the chest, giving rise to the disease known as pneumothorax. They are either secreted there by the serous membrane, generated by the decomposition of effused fluids, or introduced from without in consequence of a wound, a fistulous aperture, the bursting of a tubercle, or the perforation of the diaphragm from softening of the stomach. In the two former cases they often have the odor of sulphuretted hydrogen, and, on the chest being punctured, escape with a loud hissing noise. When very abundant, these gases seem to be incapable of absorption; and hence their presence occasionally becomes a source of much inconvenience, by the pressure which they exert upon the lungs. Dr. Davy, of Edinburgh, has analyzed the air collected from a patient who died of pneumothorax, and found the following proportions: carbonic acid, 12.5; nitrogen, 85.5; oxygen, 2. Professor Apjohn, of Dublin, in a similar experiment, found, in one hundred parts, 8 of carbonic acid, 10 of oxygen, and 82 of nitrogen.

*Ulceration* of the pleura, though occasionally observed, is to be considered as very rare. I have witnessed only a single instance of it. The patient was a female, fifty-five years of age, who died of hydrothorax, complicated with pulmonary tubercles. On opening the chest, which contained an immense quantity of sero-purulent effusion, five ulcers, of an oval shape, were seen upon the left costal pleura, the largest of which was about an inch and a half in diameter; their surface, formed by the subserous cellular tissue, was bathed with bloody matter, and their edges were red, indurated, and slightly everted. The parts around were of a brownish color, deeply injected, and incrusted with lymph. The lung contained hundreds of tubercles, in every stage of development. In the upper lobe was a large excavation, the margins of which firmly adhered around the principal ulcer of the pleura. Such erosions, seldom, if ever heal.

Fig. 153.



Ossification of the pleura. From a preparation in my cabinet.

Another affection which is sometimes noticed, and which is also very rare, is *ossification* of the pleura (Fig. 153). The bony matter, which usually appears in thin, narrow plates, is probably always preceded by cartilage, as is shown by the fact that these substances often occur together, the former being encircled by the latter. The costal pleura is the part most frequently affected by these transformations, though the pulmonary and diaphragmatic portions are not exempt from them. Their original seat is the subserous cellular tissue, the involvement of the serous membrane itself being always secondary.

The *lung*, as might be anticipated, is variously affected in pleuritis, both acute and chronic. When the effusion is very considerable, the organ may be so much compressed, that, without a careful examination, it might be regarded as totally destroyed. I have repeatedly seen it reduced to the smallest possible size, lying like a thin cake, scarcely larger than a child's hand, in the back part of the chest, beside the spinal column. When thus atrophied, the parenchymatous texture is hard and dense, devoid of crepitus, pale, and almost bloodless, the vessels being flattened, and, in some instances, partially obliterated. If the lung continue in this state for any considerable period, it becomes hepatized, or, as is more generally the case, tuberculized, and entirely unfitted for the purposes of respiration. On the contrary, should the fluid which has occasioned the compression be speedily absorbed, the pulmonary tissue will gradually expand, and finally be as pervious to the air as ever. The only exception to this rule, so far as I know, is where the organ is tied firmly down, by shreds and layers of lymph, in the hollow between the spine and ribs; in which case it will remain permanently strangulated.

But the alteration is not confined to the lung. Whenever the effusion is great, the affected side becomes manifestly larger; the intercostal spaces being not only remarkably wide, but projecting occasionally considerably beyond the level of the ribs. The diaphragm, also, is more or less depressed, and the heart is often thrust from its natural situation, either to one side, or down into the epigastric region. The extent of the dilatation varies in different cases, but does not in general exceed two inches.

Sometimes the reverse of this phenomenon is observed, the chest, instead of being dilated, being considerably contracted. The diminution results from the complete absorption of the effused fluid, and from the conversion of the adventitious membranes into fibrous, cartilaginous or bony matter. A very rapid contraction of the chest sometimes takes place after the operation for empyema.

*Heterologous Products.*—Tubercles are rarely met with, and then chiefly in connection with adventitious membranes and serous effusions, in the former of which they generally originate, varying in size from a millet-seed to that of a pea. They are of a pale straw color, opaque, and of firm consistence. They are invariably associated with tubercles of the lungs, and are often developed with great rapidity, especially in acute pleuritis.

Scirrhus and encephaloid are sometimes found in the pleura; but their occurrence is so very unusual that it is unnecessary to describe them. The same remark may be made respecting the serous cysts which have occasionally been noticed in this membrane.

# CHAPTER XVII.

## HEART AND ITS MEMBRANES.

I. *Lesions of the Pericardium.*—Inflammation.—Hydro-pericardium.—Formation of Matter and Deposits of Lymph.—Symptoms.—Effusion of Blood.—Accumulation of Air.—Serous Cysts.—Congenital Absence.—II. *Lesions of the Heart.*—Situation, Weight, and Dimensions.—Acute Carditis.—Collections of Pus.—Ulceration.—Inflammation seldom or never ends in Gangrene.—Softening.—Induration.—Cartilaginous and Osseous Degenerations.—Scirrhus and Encephaloid.—Fatty Transformation.—Sanguineous Effusions.—Serous Cysts.—Hydatids.—Atrophy.—Dilatation.—Aneurism.—Hypertrophy.—Malformations.—III. *Lesions of the Endocardium.*—Acute Inflammation.—Thickening.—Wart-like Excrescences.—Fibro-Cartilaginous, Cartilaginous, and Osseous Transformations.—Fibrinous Concretions.

## SECTION I.

### PERICARDIUM.

PERICARDITIS is unquestionably of much more frequent occurrence than is generally supposed. Most commonly induced by vicissitudes of temperature, it often exists in combination with rheumatic and gouty affections, pneumonitis, pleurisy, endocarditis, Bright's disease, and the autumnal remittent fevers of the United States and other countries. In the acute variety of the disorder, the leading anatomical characters which are to be observed in such as die, are, preternatural redness of the lining membrane, effusion of serum, and exudation of lymph.

It is rare to find the redness very bright; most generally it inclines to a lilac, purple, or light brownish tint. Presenting itself under a great variety of forms, it is sometimes seen in small dots, sometimes in arborescent lines, sometimes in considerable patches. In all these cases, the surface of the pericardium has a mottled appearance, from the intervening portions of the membrane retaining their natural color. Not unfrequently, however, the part is almost free from this, the vascularity, even when the inflammation is very intense, being extremely slight, or having so far disappeared, when the inspection is made, as to be scarcely visible. The redness is seldom uniformly diffused over the whole bag; when this happens, the inner surface exhibits a stained appearance, as if the color had been dyed into it.

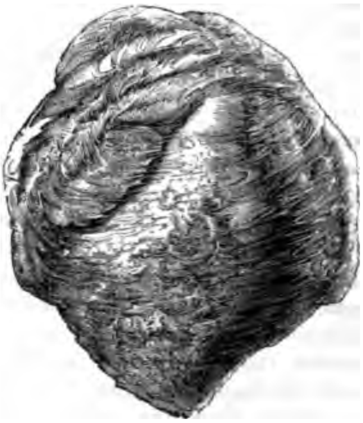
When the disease becomes chronic, or is so from the onset, the redness diminishes in intensity, and assumes a mahogany, brownish, fawn, or cinnamon tint. The effused lymph often acquires the same color, and the heart itself is usually of a bluish-white appearance. Neither in this, nor in the acute variety of the disease, does the serous membrane undergo much change. Its thickness and consistence are precisely as in health; and, although its surface is often roughened, yet this is altogether an adventitious circumstance, produced by the deposit of lymph.

Soon after the disease is fairly established, the lining membrane throws out *serum*, either of a clear limpid appearance, or of a light citron color, slightly inclining to greenish. The fluid, which is coagulable by heat, alcohol and acids, is simply an increase of the natural secretion. In many cases, it contains fragments of lymph; in others, it is mixed with pus and even with pure blood; or all these substances may be found at the same time. An effusion of blood is always indicative of high inflammatory irritation: it may be a simple exhalation from the lining membrane, or it may proceed from a rupture of some of its vessels. The quantity of serum thrown out during the first few days, is generally considerable, amounting often to from ten to twenty ounces. After this, as the violence of the disease abates, it gradually disappears, so that in the course of a week scarcely any is left. In chronic pericarditis, the serum has often a lactescent, puriform character. When the fluid remains unabsorbed, it gives rise to what is called *hydro-pericarditis*, and may amount to many ounces.

The quantity of *pus* is also sometimes very great. While in general it does not exceed a few ounces, it occasionally amounts to a pint, a quart, or even a gallon. It is commonly intermixed with serum and lymph, as in suppuration of other serous sacs. The heart often retains its normal appearance in the midst of the pus.

Contemporaneously with the effusion of serum is an exudation of *lymph*, which, at first of a pale straw color, and of a soft, viscid consistence, soon acquires a light grayish, opaline tint, and a firm tenacious character. Though occasionally deposited in small, detached patches, it commonly forms a continuous layer, which is spread over the opposing surfaces of the pericardium, both on the heart and on the origin of the great vessels. The thickness of the false membrane seldom exceeds a line, from which it may vary, in some instances, to nearly half an inch, being generally much more considerable than the false membrane of pleuritis. The adherent surface is smooth, and accurately adapted to the parts upon which it reposes; the other is rough, flocculent, and often marked with small depressions, which give it a singularly reticulated aspect, not unlike a piece of lace-work, a sponge, or a honey-comb (Fig. 154). This appearance, which is seen only in recent cases, results from the incessant movements of the heart, and

Fig. 154.



Pericarditis, showing the appearance of recently effused lymph. From a specimen in my cabinet.

may be pretty closely imitated by pulling apart two plates united by a thick layer of butter.

After this membrane has been for some time formed, it becomes vascularized, vessels shooting into it from the surrounding parts in the same manner as in adventitious structures in other situations. In this way it may become the seat of subsequent attacks of inflammation, or of tubercles and various transformations. Whilst the process of organization is going on, the exudation is gradually deprived of its more fluid ingredients, until at length it is completely converted into dense, grayish cellular tissue, cementing the contiguous surfaces closely and inseparably together. When the lymph is very thick, it sometimes assumes a laminated arrangement; in other cases, it is drawn out into transverse wrinkles, or into long, slender filaments.

In chronic pericarditis, the false membrane may contain plates of cartilage, and even small specks of bone. Occasionally we meet with compartments, filled with pus, serum, or puriform fluid; and cases also occur, and that not unfrequently, in which the lymph is studded with *tubercles*. In a preparation which I took from the body of a colored man, ninety years old, the adventitious membrane, about a third of an inch thick, contained from fifteen to twenty of these bodies, some of which were as large as a common cherry-stone. They were of a light straw color, quite hard, dense, and firmly embedded in the substance of the abnormal tissue.

It is surprising how large a quantity of fluid may occasionally exist in the pericardium, and yet the patient scarcely manifests any symptoms of uneasiness. In a case detailed by Dr. Wright, of Baltimore, although the pus amounted to a gallon, there was not the slightest appearance of impeded cardiac action; the pulse was free, moderately full, and regular; there was no embarrassment of breathing, no distress of countenance, no syncope, no præcordial pain, no œdema of the extremities. The patient, a negro, aged thirty, could lie equally well on both sides, and the day before he died he walked about the wards of the hospital with apparent ease. The formation and accumulation of this immense quantity of purulent fluid were obviously the work of time, and had commenced long before the man's death.

The muscular substance of the heart, in this disease, often remains wholly free from inflammation; sometimes, however, it is found to be considerably changed in its color and consistence, circumstances which would lead to the inference that it had participated in the derangement of its investing membrane. The organ is, at times, partially atrophied, probably from the pressure which it suffers from the effused fluid. When it has been long united with the pericardium by lymph, it is not uncommon to find hypertrophy and dilatation of the ventricles, with ossification of some of the valves, and softening of the muscular tissue. These disorders are brought about, no doubt, by the great exertions which the heart is obliged to make, in consequence of its restrained and shackled condition. Unable to act with its accustomed freedom, its fleshy fibres are in a state of constant congestion, and its chambers in a state of constant distension; whence results, on the one hand hypertrophy, and on the other dilatation of the auricles and ventricles.

Pericarditis has been observed at all periods of life, even in infancy, though it is undoubtedly most common after the age of forty. Billard, in seven hundred autopsic examinations, made at the Foundling Hospital of Paris, observed seven well-marked cases of this disease, two of which proved fatal in less than forty-eight hours after birth. In one of the latter, the adhesions between the pericardium and the heart were so strong as to lead to the belief that the malady had existed for some time prior to birth. In the other six cases, the adhesions were much weaker, and there was also a considerable quantity of sero-albuminous effusion.

Dr. Chambers, in the summary of the cases at St. George's Hospital, London, gives, as the probable cause of the disease in 135 fatal cases, the following table:—

| | | |
|---|---|---|
| Rheumatic fever in | 18 | cases. |
| Diseased kidneys | 36 | " |
| Diseased heart and dropsy | 18 | " |
| Pyæmia | 18 | " |
| Pneumonia | 10 | " |
| Vomicæ | 8 | " |
| Pleurisy | 5 | " |
| Other causes | 22 | " |
| | 135 | |

Tubercular disease of the lung is another frequent accompaniment of pericardial inflammation. It coexisted in 12 out of 57 cases noted by Bamberger,[1] and was, next to rheumatism, the most frequent cause.

It has been already mentioned that in violent pericarditis, there is sometimes an effusion of pure *blood*. In most instances it is coagulated; though the reverse is the case occasionally, at the same time that it is exceedingly dark, and almost destitute of fibrin. On examining the pericardium it is generally impossible, after the most diligent search, to discover any ruptured vessels, from which the blood might have flowed. It is reasonable, therefore, to conclude that it is the result simply of a process of exhalation, dependent upon an altered condition of the capillaries of the lining membrane. When the effusion occurs in cachectic persons, as it often appears to do in Russia and some other countries, it is not improbable that the blood itself is considerably modified in its properties, being preternaturally thin, black, and without any disposition to coagulate.

Cases occur, though very rarely, in which a considerable amount of *air* is accumulated in the cavity of the pericardium. Commonly conjoined with sero-purulent effusion, its presence may sometimes be detected by an unusually clear resonance at the lower part of the sternum, or by a sound of fluctuation produced by the beats of the heart, and by strong inspirations. Its chemical nature is not known.

*Serous cysts* have been found in the pericardiac capsule. Dr. Monro refers to a specimen of this kind, preserved in the museum of the University of Edinburgh, in which the morbid growth is nearly six inches long: the heart was of enormous size, and the patient had labored for several years under the usual symptoms of hypertrophy.

The pericardium is sometimes partially transformed into bone; and in one instance at least the *ossification* is said to have been complete. The new matter is probably deposited originally in the serous lamella, from whence it gradually extends to the fibrous membrane.

---

[1] Virchow's Archiv., vol. ix., April, 1856.

White, opaque *patches*, exhibiting considerable variety in respect to their form, size, situation, color, and consistence, are often found upon the surface of the heart. They are evidently the effect of disease, and are met with at all periods of life; but much more frequently, according to my observation, in adults and old persons than in children and infants. The latter, however, are by no means exempt from them.

In their form these patches vary in different cases. In many, if not in most, they are irregularly ovoidal, in some they are circular, in some lozenge-shaped, and in some they are triangular, or almost square. In their dimensions I have rarely found them to exceed the diameter of a twenty-five cent piece, and very often they are not larger than a split pea. Their most common situation is the anterior surface of the right ventricle, about its middle, but a little nearer to the apex than the base of the organ: they are also frequently seen on the anterior surface of the right auricle, and occasionally, though much more seldom, on the front of the pulmonary artery. They are more or less opaque, and of a bluish-white, pale-straw, milky-white, or light grayish color. Their thickness rarely exceeds that of a healthy finger-nail; they have a smooth, even surface, with defined but not abrupt edges; and they vary in consistence, from that of a simple adventitious membrane to that of fibro-cartilage, cartilage, and even bone. They are found to consist, when microscopically examined, of fibrous tissue with varying quantities of obscure granulous and oily infiltration, together with numerous elongated nuclear corpuscles.

The cause of this appearance is circumscribed pericarditis, attended with an exudation of plastic lymph, which is ultimately, by the constant attrition to which it is subjected by the action of the heart, converted into a species of adventitious membrane, similar to that which is so frequently observed in arachnitis, pleuritis, and peritonitis. In regard to the actual seat of the deposit, there is reason to believe that it is upon the free surface of the serous investment; a view which is confirmed by the circumstance that we are often able to dissect it off, so as to leave the subjacent structure entire. A specimen, strikingly corroborative of the truth of this statement, recently came under my observation in a man, twenty-eight years of age, dead of softening of the spleen. A patch, nearly an inch square, of a milky slate color, about a third of a line thick, and of a dense fibrous consistence, existed on the anterior surface of the right ventricle, near its centre; it was easily raised with the scalpel, had a perfectly smooth and polished surface, and seemed to be insensibly blended with the serous investment of the heart, its margins, where it united with the latter, being quite thin and bevelled off. A similar spot, only much smaller, and more delicate, was situated on the posterior surface of the right ventricle, to which it was so firmly attached as to render it impossible to dissect it off. A great number of white, rounded, oblong, and angular bodies, not larger than a split-pea, existed on the surface of the right auricle, and were evidently of the same nature as those already described. The portion of the pericardium corresponding with the right half of the heart was covered with similar granulations; and projecting from it, at two points, were processes of organized plastic matter, the two largest of which were fully an inch in length. All these phenomena clearly show that this man must, at no very distant period, have had pericarditis; and the only reason why the effused lymph did not everywhere exhibit the same appearance, was because it was not everywhere exposed to the same degree of attrition. Thus, on the surface of the ventricle, both in front and behind, the patches were remarkably smooth, and attached with great firmness; while on the auricle and upper part of the pericardium, where the friction was much less, they had a rough, mammillated appearance.

Finally, the pericardium is sometimes entirely *absent*. Such an anomaly is no doubt rare, and has been supposed to exist when it actually did not, from the deceptive appearance produced by the adhesion of this capsule to the outer surface of the heart.

## SECTION II.

### HEART.

The situation of the heart is influenced by diseased states of the lungs, aneurismal enlargements of the aorta, and by collections of water or purulent matter within the pleura or abdomen. In ascites, the organ is sometimes remarkably tilted up; while in hydrothorax it is frequently thrown entirely out of its natural position, so that the impulsion of its apex can be felt on the right side instead of on the left.

In the new-born infant, the position of the heart is nearly vertical, and more along the median line, as in some of the inferior animals. Its color is also of a brighter red, its muscular fibres are more distinct, and the walls of the ventricles are proportionally stouter, as well as more nearly alike in regard to their thickness.

The weight and volume of the heart vary much in different individuals, as well as at the different periods of life. Numerous attempts have been made to fix upon some standard of comparison, by which we might judge, with some degree of certainty, of its dimensions, but with so little success that the results that have been furnished can be regarded only as affording approximative evidence. Thus, Lobstein estimates its weight at nine or ten ounces; Cruveilhier at six or seven; and Bouillaud at eight or nine. Dr. Clendenning examined nearly four hundred hearts in persons of both sexes, and at all ages after puberty. The result was about nine ounces avoirdupois for the male, and seven ounces and a half for the female; or, as it respects the entire body, at the rate of about 1 to 160 for the former, and 1 to 150 for the latter. Dr. John Reid, in eighty-nine cases, found the average weight of the male heart to be eleven ounces and one drachm, and of the female heart, in fifty-three cases, nine ounces and half a drachm. In ten examinations by myself, the medium weight was eight ounces and a half; the minimum seven, and the maximum ten and a half.

Laennec merely observes that the heart ought to be about the size of the fist of the subject; a means of comparison, which, although somewhat vague, will usually be found, according to my experience, to be very near the truth.

I have found the average length of the ventricles, including the apex of the organ, to be four inches; of the auricles, one inch and three-quarters. The mean circumference, measured around the auriculo-ventricular groove, is nine inches and a half; the breadth four inches. The thickness of the ventricles varies in different parts of their extent. Thus, the thickness of the right is scarcely two lines at the middle, whilst it is nearly two and a half at the base, and about one and a quarter at the apex. So also of the left ventricle; whilst it is seven lines in thickness at the centre, it is only six at the base, and four and a half at the apex. Of the right auricle, the mean thickness is one line; of the left, one line and a half. The thickness of the inter-ventricular septum also varies in different parts of its extent, being at its maximum at the middle, where it is six lines and a half, and at its minimum at the apex, where it is nearly the sixth of an inch less. The mean thickness of the inter-auricular partition is one line and a half.[1] These measurements are founded upon a careful examination of twelve hearts taken from male and female subjects, between twenty-five and forty, and which were, in every respect, so far as I could determine, perfectly sound.

The mean circumference of the mouth of the aorta, measured in the same subjects, was two inches and three-quarters; of the pulmonary artery, three inches and a sixth. Of the left auriculo-ventricular orifice, the average circumference was four inches; of the right, four inches and a half.

The lesions of the muscular structure of the heart may be arranged under the heads of inflammation, suppuration, gangrene, and ulceration; scirrhus, encephaloid, melanosis, and tubercle; softening; induration; cartilaginous, osseous, and fatty transformations; hypertrophy, atrophy, dilatation, and rupture.

1. *Inflammation.*—Acute carditis is an extremely rare disease, especially that variety of it which invades the whole organ. In the majority of instances, it is conjoined with inflammation of the investing capsule; in others, however, it exists as an independent affection. Of general carditis, very few well authenticated cases are upon record. The disease seldom assumes that acute type which generates pus; in which respect it offers a striking analogy with inflammation of the

---

[1] Professor Lobstein, of Strasburg, attributes the following mean dimensions to the healthy adult heart: length, from the base to the apex, five inches and a half; breadth, at the base, three inches; thickness of the walls of the right ventricle, at the upper part, two lines and a quarter, at the lower, half a line; of the left seven lines superiorly, and four inferiorly; thickness of the right auricle, one line, and of the left, half a line.—*Traité d'Anatomie Pathologique*, t. ii.

M. Bouillaud found the mean circumference of the organ, measured around the base of the ventricles, to be eight inches and three-quarters; the mean length, from the root of the aorta to the apex, nearly three inches and two-thirds; and the same, as the mean breadth, measured at the base. The average thickness of the right ventricle, stated in round terms, is, according to the same authority, two lines and a half, and that of the left, seven lines; of the right auricle, one line, and that of the left, one line and a half.—*Traité Clinique des Maladies du Cœur*, t. i. p. 52.

voluntary muscles. Of this mode of termination, however, several examples have been related by pathologists.

The disease is much more frequently partial, or limited to particular parts of the organ. Here, as in the other variety, the inflamed structure is always unnaturally red, and crowded with small crimson points, of an arborescent, stellated, or punctated configuration. Occasionally, as when the irritation is very severe, we meet with spots of extravasated blood, of a bright red, violet, or purple tint, which impart to the surface of the organ a singularly speckled aspect. Inflammation of the muscular substance of the heart is rarely, if ever, attended with tumefaction. Why this should be the case will be at once perceived when we reflect upon the intimate and almost inseparable connection of the fleshy fibres; for, of all the muscles in the body, the heart is the one which has the least amount of cellular matter. Hence, serous infiltration, which is so common in some other structures, can have no place in this. When the inflammation is seated superficially, the affected part is often covered with globules, shreds, or patches of lymph, poured out by the visceral portion of the serous membrane of the pericardium, from a propagation of the disease. Its consistence is often much diminished; and the muscular fibres may be bathed in imperfectly elaborated pus.

When the disease passes into *suppuration*, the pus is either diffused through the muscular substance, or collected into little abscesses. In the former case, the matter, on a section being made of the affected part, oozes out at various points from among the fleshy fibres, which are of a deep brownish or dark color, and so soft as to yield under the slightest pressure. Abscesses of the heart are always small, and their contents are generally rather of a fibrinous than of a distinctly purulent character. In a few rare instances the matter has been found to be encysted.

Is it possible for the muscular structure of the heart to become *gangrenous?* Many writers suppose that it is not, alleging, as a reason, that, as this organ is so essential to life, this termination of inflammation is always anticipated by death. Others, however, not only admit the possibility of it, but cite cases in confirmation of their opinion. My own belief is that such an occurrence is impossible, death ensuing long before such an event could take place; and that the instances which have been published of this so-called termination, have been merely examples of softening, rapidly followed by putrefaction.

Circumscribed carditis is sometimes attended with *ulceration.* The lesion is more frequently found on the internal than on the external surface of the organ, and commonly supervenes upon inflammation seated originally in the lining or investing membrane. The external ulcer sometimes extends deep into the substance of the heart, leaving merely a thin stratum of muscular fibres. The cardiac texture around is generally very hard, pale, and so friable as to break down under the slightest pressure of the finger. The matter with which these ulcers are bathed, is of a bland, homogeneous nature, like laudable pus in other situations, but now and then it is mixed with bloody serosity. Ulceration is a frequent cause of rupture of the heart.

2. *Softening.*—The heart, like other organs, is liable to softening,

which may be either partial or general, though the latter must be considered as extremely rare. It may coexist with various other lesions, such as hypertrophy of the walls of the organ, or dilatation of its cavities, or it may take place as an independent affection. Occasionally, the softening is limited to the outer surface of the heart, the inner surface, or to the fleshy columns; and not unfrequently it is found in small isolated points, running insensibly into the healthy texture. No unnatural odor attends this lesion, in which respect it differs remarkably and characteristically from gangrene.

The cardiac substance, in a state of softening, is extremely flaccid, tears with great facility, and is of a deep red color. The finger can be pushed through it in every direction, and when the ventricles are opened, they often collapse to so great a degree as to lose entirely their natural figure. This, however, is by no means a uniform occurrence; for, in many instances, the softened organ accurately retains its natural form. The color of the cardiac tissue in this affection is variable. Most commonly, perhaps, as was before stated, it is of a deep red; but occasionally, it is claret, maroon, red-brown, violet, or purple. In other cases, again, it is of a faint grayish hue, cineritious, pale yellow, or almost white, as if the organ had been macerated for some days in water.

The disease is either of an acute or chronic nature, and is often associated with pulmonary phthisis, chronic pleurisy, typhoid fever, and other exhausting diseases. I have repeatedly met with it in old apoplectic subjects: its cause is not known.

3. *Induration.*—Induration of the heart is probably induced by inflammation; most generally, however, of a chronic character. It rarely involves more than a part of the organ, commonly one of the ventricles, which is at the same time in a state of hypertrophy. Sometimes it is confined to its outer or inner surface, to the fleshy columns, or to the inter-ventricular septum; and not unfrequently it co-exists with softening. Universal induration is perhaps never met with; such an occurrence, in fact, would hardly be compatible with the exercise of the functions of the heart.

The degree of induration is subject to considerable variety, running through numerous stages, from the fibrous to the cartilaginous, and even the osseous. In some instances it appears in the form of incrustations, seeming as if it had commenced, in the first instance, in the serous covering of the organ. The muscular substance is not always heightened in color; sometimes, indeed, it is even unnaturally pale. When incised, it is found to be so firm as to grate under the knife. The organ, if placed on a table, generally retains its rounded form, and, if struck with the scalpel, sometimes sounds like a dice-box.

4. *Transformations.*—The cartilaginous and osseous transformations of the muscular structure of the heart are extremely rare. Corvisart saw the apex of the organ, in its entire thickness, and the fleshy columns of the left ventricle, converted into cartilage. Haller, Albertini, Bertin, and others, have observed partial ossifications; and Mr. Allan Burns found the ventricles of the heart of an old woman of sixty so completely changed that they resembled the bones of

the cranium. This case, the most remarkable perhaps on record, was attended with violent dyspnœa, great præcordial anxiety, and lividity of the countenance. The patient was unable to lie in any other than a semi-erect position; and, for a few days before her death, the pulse, although previously regular, became extremely feeble and intermittent. On dissection, the pericardium was found of an opaque, dusky color, excessively loaded with fat, closely adherent to the substance of the heart, and studded with ragged, projecting spicules of bone, which gave it a very rough and irregular aspect. Both ventricles were completely ossified, excepting about a cubic inch at the apex, the new tissue forming a broad, solid belt, as firm as the cranium. The auricles were sound, only a little thicker than usual, and so also were the great vessels.

5. *Heterologous Formations.*—Scirrhus and encephaloid have been found in the substance of the heart, but their occurrence is extremely rare. They generally exist in the form of small spherical tumors, varying between the size of a pea and an egg, which stud the outer surface of the organ or project into its cavities. Cases occur in which they are seen in layers several lines in thickness, or where they are infiltrated into the muscular texture, converting it into a whitish or yellowish substance.

*Melanosis* of the heart has been noticed in a few instances, in connection chiefly with melanosis in other parts. In the case detailed in the chapter on the general history of this disease, the deposit existed in all the principal viscera, as well as in the lymphatic ganglions and subcutaneous cellular tissue. In the heart the black matter occurred, both externally and internally, in the form of small rounded spots, from the size of a pin's head to that of a small hazel-nut. They were most numerous in the right auricle.

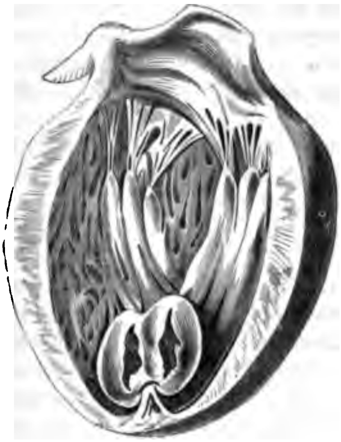
*Tubercles* are among the rarest deposits to which the heart is subject. I have seen them only in one instance in a great many dissections. The patient was a man forty-four years old, who died of pulmonary phthisis, attended with the formation of large cavities. On laying open the heart, the left ventricle was found to contain five distinct tubercles, embedded in its muscular substance, of a pale yellowish tint, of a firm consistence, and of an irregularly rounded form, their size varying from that of a small currant to that of a pea. The organ was of a pale reddish color, and softened throughout. No symptoms had existed calculated to awaken suspicion of cardiac disease.

Tubercles of the heart usually coexist with similar deposits in other organs, as the lungs, lymphatic ganglions, spleen, and peritoneum. They have been found in different portions of the organ, and at different periods of life. Professor Gilman, of New York, has detailed the particulars of a case in a child twenty-two months old.

6. *Cysts and Hydatids.*—Serous Cysts have been found in the muscular substance of the heart, from the size of a pea to that of an ordinary walnut. They are usually of a globular shape, smooth on the surface, very simple in their structure, and filled with a clear limpid fluid.

*Hydatids* of the heart are still more rare than serous cysts, with which they have sometimes been confounded. In number they vary from one to a great many, and in volume from that of a pea to that of an orange, the average size being that of a pigeon's egg. They belong to the acephalocyst tribe, having a distinct cyst firmly embedded in the cardiac tissues, and usually containing more or less serous fluid, or a soft, yellowish curd-like substance. This rare form of disease has been observed at different periods of life, but chiefly after middle age.

Fig. 155.



Cyst in the left ventricle. From a specimen in my collection.

Cysts, containing a kind of atheromatous substance are occasionally found in the heart. In the accompanying sketch (Fig. 155) the sac, which occupied the interior of the apex of the left ventricle, was about the size of a small hickory-nut, and was filled with a pultaceous matter, having very much the aspect and consistence of a semi-organized clot of blood, only that it was much more friable. It was perfectly free within the cyst, which was of a globular shape, hardly as thick as a serous membrane, and situated among the fleshy columns, to which it was firmly attached. The heart was in other respects sound.

7. *Fatty Degeneration.*—Fatty transformation of the heart has lately attracted much attention. It exists in two forms. In one, an unusual quantity of fat is deposited upon the surface of the organ; and in the other its walls are converted into adipose matter. Both these varieties have been classed together as fatty degeneration; although this term would be more strictly applicable to the latter condition, in which a positive transformation of the muscular structure occurs.

In the first form, a layer of fat, of variable thickness, and of a yellowish color, envelops the heart. It always begins to form along the course of the nutrient vessels of the heart, and is generally more abundant on the right side than on the left. The cells of which it is found to consist, when minutely examined, may extend inwards among the muscular fibres, separating them until they reach the endocardium, where they give rise to little protrusions. The effect of this encroachment of fat is to lead to distortion and to subsequent atrophy of the muscular fibres, many of which, nevertheless, retain, to an astonishing degree, their normal appearance, and remain unmolested. This condition is mostly found in fat individuals.

In the second form, a true transformation of the muscular substance occurs. The fibres lose their striated appearance, and become filled with granules and oil globules, frequently arranged in longitudinal lines. This fatty transformation may occur only in spots, or throughout the whole organ. It renders the organ very soft and lacerable, and imparts to it a pale yellowish color. Hypertrophy of the heart is frequently associated with this condition. It seems also to be one of the main causes of rupture of the organ. In 68 cases recorded by Dr. Quain, fatty degeneration existed in 25. The disease is met with in connection with phthisis, diseases of the liver and kidneys, endocarditis, pericarditis, and obstruction of the coronary arteries. The immediate cause is supposed to be a chemical change in the fleshy fibres, induced by deficient nutrition.

8. *Apoplexy.*—The heart, like the voluntary muscles, is subject to hemorrhagic effusions; the lesion, however, is very infrequent, and is seldom met with unconnected with scurvy and putrid fevers. The blood may occur in small superficial patches, or petechial spots, or it may be infiltrated among the fleshy fibres, or, finally, it may be collected into a factitious cavity, and thus constitute what has been called apoplexy of the heart. In whatever form it is poured out, it exhibits the same appearances as in apoplexy of the brain and other parenchymatous organs, being dark and fluid in recent cases, but red and coagulated in those of longer standing. The muscular fibres may be perfectly sound, as is observed when the lesion is very slight or superficial, or they may be broken down and extensively separated. In the latter case the effusion can scarcely fail to be a cause of rupture of the heart. It is worthy of remark that this lesion is almost exclusively confined to the left ventricle, and that it generally coexists with hypertrophy.

9. *Atrophy.*—The heart, like the rest of the muscular system, is liable to atrophy; but the affection is infrequent. The wasting is occasionally very great. In the majority of cases it is limited to particular parts of the organ, more commonly to the right ventricle, the right auricle, and inter-auricular septum. The color and consistence of an emaciated heart are seldom much altered; frequently, indeed, they remain perfectly natural, or are even augmented. It has been said that, when the atrophy is very great, the organ sometimes presents a puckered and shrivelled appearance, like an old withered apple; but such a condition I have never witnessed. The cardiac chambers, in this affection, may be natural, diminished, or dilated, very much as in hypertrophy. When greatly expanded, the walls of the heart may be so thin as to exhibit a translucent, web-like aspect, and so weak as to be liable to break on the application of the slightest force.

Atrophy of the heart usually occurs in persons who are worn out by lingering and exhausting diseases, terminating in general emaciation of the body. Hence it is not unfrequently found in connection with organic affections of the lungs and bowels, dropsy, diabetes, cancer, and other incurable disorders. Excessive bleeding, especially when united with great abstinence, ossification of the coronary artery, and protracted compression from enlarged lymphatic glands or effused fluids, may also be so many causes of atrophy of the heart. In one instance I found it connected with permanent closure of the inferior cava and extensive disease of the abdominal organs, with collection of water in the peritoneal sac.

10. *Hypertrophy.*—Hypertrophy is an excessive growth of the muscular substance of the heart, resulting from increased nutrition, with-

out any obvious change of texture. In the first and most simple form, the walls of the heart are merely thickened, the cavities retaining their natural dimensions; in the second, they are augmented in bulk, and the corresponding chambers dilated; in the third, they are thickened and the cavities contracted.

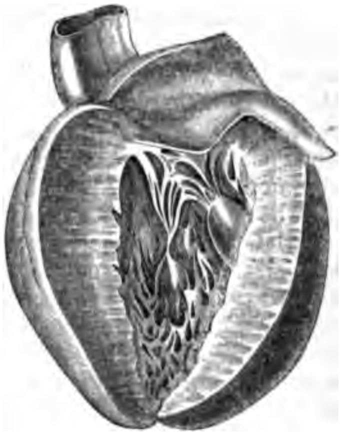
In the majority of cases, the abnormal growth is confined to the walls of the ventricles, of which the left is more prone to suffer than the right. The auricles seldom participate in it; on the contrary, they generally remain sound, even when the rest of the heart is enormously enlarged; a circumstance probably depending upon the paucity of their muscular fibres. Occasionally the hypertrophy exists only in particular parts, as the base, apex, inter-ventricular septum, or fleshy columns.

A hypertrophous heart is usually more firm and red than natural; but these characters are not essential; and, when present in a high degree, they constitute the affection which has been already noticed under the head of induration. The increase in the thickness of the walls of the organ varies in different cases; thus, it may be two, three, or even four times the ordinary volume. In a remarkable instance of general hypertrophy, conjoined probably with dilatation, related by Dr. Wright,[1] of Baltimore, the heart, after being injected, weighed five pounds, three ounces, its circumference at the base being seventeen inches and a half, near the apex twelve inches and a half, and its length, from the top of the right auricle to the point of the left ventricle, thirteen inches. An example of general hypertrophy of the heart, hardly less extraordinary than the one just mentioned, I had occasion to observe in a boy, seven years of age, whose body I examined along with Dr. Wood and Dr. Ridgely. The organ was of an obtuse conical shape, and considerably larger than we usually find it in the adult, its weight being ten ounces and a half after the removal of the great vessels. The thickness of the wall of the right ventricle was three lines; of the left, six lines and a half. The inter-ventricular septum was also unnaturally stout, and the parietes of the auricles were nearly double the normal dimensions; the cardiac chambers had a correspondingly increased capacity; the pericardium adhered everywhere very closely to the outer surface of the heart; the mitral valves were rough and indurated; and the endocardium of the left auricle and ventricle was very much thickened, opaque, and of a dense, fibrous consistence. The child had labored under symptoms of disease of the heart for eight months. All the other viscera were sound. In such cases as those now mentioned, the organ is very apt to become altered in its figure; it loses its elongated conical appearance and assumes a globular shape; and, instead of lying obliquely in the chest, as it naturally does, it is made to take a transverse position; thus encroaching so much upon the left lung as to force it high up into the thoracic cavity. When great enlargement is accompanied with adhesion of the pericardium, the heart is secured by the attachments of the membrane in a higher situation than its weight would otherwise dispose it to assume; and, being thus impacted between the spine and fore part of the chest, it sometimes occasions a preternatural prominence of the præcordial region.

---

[1] American Journal of Medical Sciences, vol. xii. p. 54.

Fig. 156.



Hypertrophy of the left ventricle. From a specimen in my collection.

The *left ventricle*, as previously intimated, is much more liable to hypertrophy than the right, and often attains a very considerable bulk. (Fig. 156.) In my own dissections, I have never seen the thickness exceed an inch and a quarter; but it may amount to an inch and a half, an inch and three-fourths, and even two inches. The situation of the greatest increase is commonly somewhat above the middle of the ventricle, opposite the attachment of the fleshy columns. From this point it diminishes rather suddenly towards the aortic orifice, and gradually towards the apex, where it is reduced to less than one half. Generally speaking, the fleshy columns participate, though occasionally, especially when there is much dilatation, they appear to be flattened and emaciated. When the hypertrophy is very great, the ventricle may not only occupy the left præcordial region, but extend far under the sternum, where its impulse and sound may be mistaken for those of the right.

In hypertrophy of the *right ventricle*, whether alone or coexistent with that of the left, the greatest thickening is generally near its base, where it often amounts to twice the natural bulk. Increase of substance without dilatation is much more infrequent in the right than in the left ventricle; and, what is remarkable, the growth is much oftener noticed in the fleshy columns than in its walls, being sometimes so curiously interlaced as to traverse the cavity in every direction, subdividing it into various compartments, and, in some cases, almost filling up. When the ventricle in question is alone hypertrophied, it may descend lower than the other, and so form the summit of the organ.

Hypertrophy of the *auricles* is almost invariably conjoined with dilatation, but the two other forms are not without example. The thickening seldom exceeds twice the natural size, and, as it is even then inconsiderable, it may be easily overlooked by a superficial observer. Sometimes the pectinate muscles are the only structures in which the hypertrophy shows itself: more commonly it is uniformly diffused throughout the walls; and, as these are naturally thicker in the left auricle than in the right, it is in the latter that the increase generally attains its greatest height.

Hypertrophy of the walls of the ventricles generally results from great and habitual accumulations of blood in their cavities, produced by disease of the semilunar valves, or contraction of the mouth of the aorta and of the pulmonary artery. In the same way may arise hypertrophy of the auricles; or it may be occasioned, more directly, by a narrowing of the ariculo-ventricular apertures, preventing the ready ingress of blood from one chamber of the organ into the other. Hypertrophy of the right side is also frequently dependent upon disease of the lungs, as tubercles, emphysema, and hepatization of their tissue.

11. *Dilatation.*—Occasionally we find that the chambers of the heart, instead of being diminished in size, are dilated, so that their capacity is much greater than in the normal state. This condition of the organ may be general or partial, that is, it may exist in all the cardiac cavities at the same time, or be limited to the auricles, the ventricles, or to one of these reservoirs alone, which is, in fact, most commonly the case. Universal dilatation is extremely infrequent. The heart in this state is sometimes much increased in weight.

Dilatation of the heart may be conveniently arranged under several varieties. The first consists of dilatation with hypertrophy; that is, one or more of the chambers of the heart are enlarged, and the corresponding walls thickened. The second variety is the simple dilatation, in which the cavities are augmented, whilst the corresponding parietes retain their normal state. The third consists of dilatation with atrophy; that is, one or more of the cardiac reservoirs are enlarged, and the corresponding walls attenuated. A fourth, and much the rarest variety of all, that which truly deserves the name of aneurism, is where there is a pouch or blind sac leading from, and communicating with, the affected cavity. These different forms, especially the first three, sometimes coexist in different parts of the heart, and even in different parts of the same chamber; and several of them are very commonly found in conjunction with hypertrophy.

Of the first and third varieties of the disease it is not necessary to make any particular mention, beyond the fact that, in the one the walls of the heart are always natural, in the other hypertrophied. The dilatation is generally partial, and is most frequent in the left ventricle.

In dilatation with atrophy there is often softening of the muscular structure, with an alternation of color, which, instead of a florid red, is either pale gray, cinnamon, brown, or purple. The emaciation, which varies in different cases, is sometimes so great that the most substantial portion of the organ is scarcely more than the eighth of an inch in thickness. The fleshy columns are stretched and attenuated; and occasionally, though very rarely, the muscular structure is so much unfolded that the whole heart looks like a membranous pouch. Extreme emaciation is more common in the right than in the left ventricle, in the right than in the left auricle; a circumstance easily accounted for by the natural difference of thickness between the two sides of the organ. Formerly this variety of dilatation was regarded as a very frequent lesion; but more recent observation has shown that this opinion is erroneous.

The fourth variety of dilatation, also comparatively rare, presents itself in the form of a pouch in the walls of the heart, constituting what is called the *sacculated aneurism.* It occurs almost exclusively on the left side of the organ. In sixty-seven cases analyzed by Mr.

Thurman,[1] it affected the left ventricle in fifty-eight, the left auricle in nine.

Sacculated aneurism of the left ventricle exists under two principal forms, either without external deformity, or as a tumor varying in size from that of a nut to that of the heart itself. The sac is generally of an elongated, globular shape, and almost always contains, especially when of long standing, a number of dense, laminated concretions, or reddish amorphous coagula; it communicates with the corresponding cardiac chamber, either by a wide orifice, often as large as the sac itself, or, as is more commonly the case, by a narrow, rounded opening, with hard, prominent, and well defined margins. Its parietes may be formed by all the component structures of the heart, by the muscular fibres and pericardium, or, finally, by the pericardium and endocardium alone. Although there is seldom more than one sac, yet sometimes there are two, three, and even four. The parts of the left ventricle most frequently affected are those which are thinnest, as the apex and the highest point of the base. The heart in this affection may be perfectly natural; but in general it is more or less changed by disease, atrophied, dilated, or hypertrophied; the pericardium, endocardium and mitral valves are also frequently altered. The disease is most frequent in males, and is seldom seen before the age of thirty. Inflammation of the endocardium, and of the superjacent muscle is considered by some as its most frequent cause.

Aneurism of the auricles is still more infrequent than that of the ventricles. It is seldom that the disease is distinctly circumscribed or sacculated; on the contrary, it is generally pretty uniformly diffused over the entire sinus. In nine cases examined by Mr. Thurman, the disease existed on the left side, and was connected with, and apparently dependent upon, an extreme contraction of the mitral orifice, impeding the passage of the blood from the left auricle to the corresponding ventricle. "The dilated walls of the cavity are often thickened, and the seat of fibro-cellular degeneration. The lining membrane is opaque, rough, and otherwise diseased,—in some cases even ossified,—and is lined with fibrinous layers, very similar to those met with in arterial aneurisms. Occasionally the dilatation is confined to the auricular appendage, which becomes excessively distended with lamellated concretions."

The causes of dilatation of the heart are, valvular disease, narrowing of the auriculo-ventricular orifices, contraction of the mouth of the aorta or pulmonary artery; in short, whatever has a tendency to impede the passage of the blood from the auricles into the ventricles, or from the ventricles into the great arteries connected with their base.

12. *Rupture.*—Rupture of the heart is generally, if not invariably, the result of ulceration, or of softening, caused by fatty degeneration of its muscular substance. It is more common in men than in women, and is seldom met with before the age of fifty. Of 23 cases analyzed by Dr. Hallowell, of this city, twenty occurred after this period. In the case from which the annexed sketch was taken, the rupture took place at

---

[1] Medico-Chir. Trans. of London, vol. xxi. p. 187.

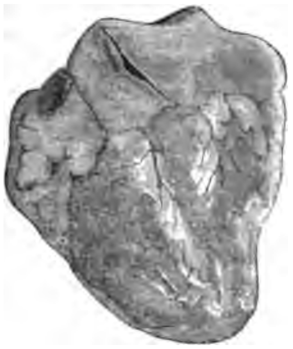
twenty-eight. The lesion is by far most frequent in the wall of the left ventricle, the right ventricle, the two auricles, and the internal septa rarely suffering. The opening varies much in shape and size; sometimes it is a mere slit, as in the accompanying cut; while at other times it is a large, ragged rent, from an inch to an inch and a half in length. The cardiac tissue around the seat of rupture is generally ulcerated, softened, or softened and hypertrophied, or, finally expanded and attenuated. In a few rare instances it has been found healthy.

The quantity of blood poured out through the accidental opening varies from a few ounces to a pint or more. When considerable, the pericardium forms a large, bluish, and elastic bag, and the heart is completely concealed by the sanguineous mass, which is either in a liquid, semi-fluid, or coagulated state, and of a dark venous color.

Through the kindness of Dr. E. McClellan and Dr. S. P. Brown, of this city, I had an opportunity recently of examining two specimens of rupture of the heart, of which I annex a brief history.

The first case was that of a colored man, twenty-eight years of age, for the last five of which he had suffered, off and on, from attacks of dyspnœa. He fell down in the act of dressing himself, and expired almost instantly. The pericardium was greatly distended with coagula, and the heart was in a state of fatty degeneration, its walls being very thin, especially on the left side. In the left auricle was a small rent, about three-quarters of an inch in length, with indurated edges, as if it had been caused by ulceration. Each cornea had a well marked senile arch. The situation, size, and shape of the opening are well represented in the adjoining cut. (Fig. 157.)

Fig. 157.



Rupture of the heart.

Dr. Brown's case was a large, stout woman, aged seventy, an out-door dispensary patient, of whose previous history nothing definite is known. The day before her death she complained of great distress in the region of the heart and chest, with inability to sit or lie down, and pain in the left arm. The pericardium contained between three and four ounces of blood, intermixed with some serum, and proceeding from a rupture of the left ventricle, an inch and a quarter in length, extending along its anterior surface from near its apex towards its base; its margins were ragged and irregular. Immediately to the left of this fissure, and communicating with it internally, was another aperture, large enough to admit a goose-quill. The lacerated portion of the ventricle was hardly a line and a half in thickness, while the remainder was from seven to eight lines. The right branch of the anterior coronary artery was in a state of ossification, and seemed to have caused the wasting of the muscular fibres which led to the rupture. The heart, somewhat enlarged, and loaded with fat, had undergone the adipose degeneration.

The aorta exhibited numerous cartilaginous deposits, and its valves were slightly ossified.

However induced, laceration of the heart is almost always followed by immediate death. The cause of this disastrous consequence is probably not so much the extent of the hemorrhage, as the great and sudden shock sustained by the nervous system, together with the mechanical compression of the cardiac chambers. If the patient survives the accident several days, the rent is generally plugged up by a clot of fibrin, in the same manner as sometimes happens after a wound of the heart. In some instances nature makes an effort at cicatrization, in which, however, she never succeeds.

The opening, which usually presents itself in the form of a slit or fissure, varies in size in different cases. While it seldom exceeds half an inch, it is sometimes so small as to be scarcely perceptible, and at other times so large as to admit two or three fingers. In one instance the rupture extended from the base to the summit of the left ventricle. The fissure generally runs in an oblique direction, has a ragged, shreddy appearance, and is often narrower at the inner than at the outer surface of the heart. When there are two or more apertures their tortuous grooves and canals occasionally unite and form a common communication with the corresponding cavity. This, however, is rare. The slit, although ordinarily parallel with the longitudinal axis of the heart, may be oblique or even horizontal. The rents are sometimes multiple, two, three, four and even five having been seen in the same heart.

A partial rupture of the heart, consisting in a laceration of the fleshy columns and tendinous cords of the valves, has been noticed. The causes are violent exertions, as coughing, sneezing, or retching, and the symptoms a sudden sense of suffocation, overwhelming faintness, and great anxiety of the countenance, followed by all the phenomena of organic disease of the heart. The valves themselves are occasionally ruptured, though this is rare.

13. *Malformations.*—The heart, like other organs, is liable to malformations. These, though not frequent, are so various as to render it extremely difficult to classify them according to philosophical principles. Any generalization, indeed, that may be offered must necessarily, in the present state of the science, be imperfect and susceptible of future improvement. The following, without pretending to anything more than ordinary accuracy, will be found to embrace an account of the more interesting varieties hitherto noticed. Before we proceed to indicate this arrangement, it should be stated that the different congenital deficiencies of which we shall speak, may be conveniently viewed in reference, first, to the parietes of the organ; secondly, in respect to its internal septa; thirdly, in relation to its valves; and, fourthly, in regard to the origin and termination of the great vessels.

(I.) 1. The heart consists only of one auricle and one ventricle. This malformation, however, is rare. The organ gives origin to a single vascular trunk, which presently divides into the aorta and pulmonary artery. The type of this imperfection is to be found in fishes, in which the single heart and artery, with its branchial arches, are permanent parts. The malformation is always hostile to the prolongation of life, the infant generally dying within the first twelve days.

2. Both auricles are wanting; or there are two ventricles, with one auricle; or, finally, two auricles, with one ventricle. These cases are likewise extremely rare; in a few instances the patient attained the age of manhood.

3. The auricles have a sort of supernumerary appendage. Of this species of malformation De Haen and Billard have each recorded an instance.

4. The apex of the heart is bifurcated, or there is a deep groove marking the junction of the ventricles. The former of these appearances naturally exists in the human embryo, and constitutes the type of what is found in several species of mammalia, as the dugong and manatee.

(II.) The second series comprehends the malformations of the internal partitions, of which the most frequent and important are those of the inter-auricular septum. The aperture which naturally exists at this part is generally closed within the first few days after the establishment of the respiratory function, by a fold of serous membrane, situated in the left side of the heart. This valve is sometimes defective, perforated, or entirely absent. More frequently, however, there is an arrest in the development of the muscular substance, eventuating in the formation of an imperfect partition. The septum thus produced is seldom more than three lines in diameter, but occasionally the deficiency is complete. This malformation frequently coexists with patescence of the arterial duct. Although the individuals usually die within the first six months, yet cases are mentioned where life was protracted to the twentieth, thirtieth, fortieth, and even fiftieth year.

A congenital opening between the two ventricles is by no means common; at any rate very few such cases have been recorded by writers. The form of the aperture is generally rounded, with smooth, polished margins; and, in the majority of instances, it is situated at the superior part of the septum, not far from the origin of the great vessels. With this vice there is frequently patescence of the arterial duct and oval foramen, with contraction of the pulmonary artery. The essence of this imperfection exists in the heart of the alligator, in which the ventricles naturally communicate with each other during life. Infants thus affected usually die soon after birth. Dr. Da Costa has in his possession a heart in which a large opening, with smooth margins, existed between the two ventricles, the child surviving four months. Pulteney relates the case of a patient who reached his fourteenth year.

(III.) The valves rarely exhibit congenital imperfections. Sometimes they are deficient in numbers, but more frequently they are too short, reticulated, or perforated, so as to serve as incomplete barriers to the regurgitating fluid. The sigmoid, mitral, and tricuspid valves have all been found stretched flat across their respective orifices, with one or more apertures in their substance. The Eustachian valve is more frequently deficient than any other.

(IV.) The fourth class of malformations relates to the origin and termination of the great vessels, which often exist without any accompanying imperfections of the heart. Of these, several varieties may be enumerated.

1. The aorta arises from both ventricles. This state is commonly accompanied with patescence of the oval foramen and arterial duct, the latter of which occasionally ends in a cul-de-sac in the substance of the heart. The pulmonary artery is either contracted, obliterated, or entirely absent. Death ensues at various periods, from the first day to the fourteenth year. The symptoms are such as denote a mixture of venous and arterial blood, namely, lividity of the prolabia, palpitations, and paroxysms of suffocation.

2. The pulmonary artery springs from both ventricles. This is also a very rare variety of malformation. The ovale foramen remains open; and the vessel sends off the descending aorta, the ascending arising in the ordinary way.

3. The aorta arises from the right ventricle, and the pulmonary artery from the left. In this transposition, the veins generally retain their normal disposition. The oval foramen and arterial duct are also sometimes closed.

4. Both vessels originate from the same ventricle. This is extremely rare. Several well-authenticated cases, however, are on record. The internal septa of the heart are usually imperfect in this variety of malformation.

5. The arterial duct opens directly into the right ventricle, the aorta and pulmonary artery exhibiting nothing unusual in their size or mode of arrangement. This irregularity has been observed only three or four times.

In regard to the venous trunks, the deviations from the normal standard are not less singular. Thus, the right auricle has been known to receive the pulmonary veins, and the left the superior or inferior cava, or both. Meckel relates an instance where the coronary vein opened into the left ventricle; and Breschet records one where the hepatic veins emptied directly into the right auricle. The latter cavity also sometimes receives the azygos vein. Le Cat narrates a case in which this vessel divided, near the heart, into two branches, of which one terminated in the right auricle, the other in the left.

*Acardia*, or total absence of the heart, is extremely rare, and never occurs without being associated with other vices of conformation, of which the most common is deficiency of the brain. Such a state, whether simple or complicated, is of course inconsistent with the continuance of life. A double heart has occasionally been observed, but in no instance, perhaps, without a monstrous condition of the majority of the other organs.

Finally, the heart, instead of being situated obliquely, is sometimes placed, like the heart of a quadruped, in a line with the sternum; and, occasionally, though rarely, it is found to protrude externally, through an opening in the chest. Cases have been observed where it lay in the epigastric region, on the outside of the ribs, and in the substance of the liver. Baudelocque examined the body of an infant, in which there were two distinct hearts, one of which occupied the abdomen, the other the thorax. Instances are also recorded in which the organ was situated in the right side of the chest. These cases are usually associated with transposition of the abdominal viscera.

## SECTION III.

### ENDOCARDIUM.

Endocarditis is quite common, and is generally produced by the same causes as pericarditis, with which it frequently coexists. It is characterized anatomically by redness, thickening, and opacity of the affected membrane, with deposition of lymph on its free surface. Redness alone cannot be considered as indicative of inflammation, as the same appearance is produced by cadaveric imbibition. The color varies from a light rose to a scarlet, violet, or brownish tint, and ordinarily occurs in small circumscribed spots, which are always most conspicuous on the valves. Sometimes it is universal; and, on the other hand, it may occasionally be almost entirely wanting. The redness seems to depend rather on a tinging of the endocardium than on true capillary injection; and, although it seldom extends into the subjacent cellular texture, it cannot be easily washed away.

In acute inflammation the endocardium is rarely much thickened; under the influence of chronic irritation, on the contrary, it often acquires the density and consistence of a fibrous membrane. In the healthy state it is perfectly smooth, polished, and so firmly adherent that it can be detached only in very small shreds; but, under protracted disease, it becomes opaque, rough, and of a milky white, and can be easily raised in considerable patches. Occasionally the thickening is entirely dependent upon hypertrophy of the subjacent cellular tissue, or it may be produced by a layer of adventitious membrane.

In very acute cases, there may be softening of the endocardium, with infiltration of pus, serosity, or bloody matter into the subjacent cellular texture. Ulceration also is sometimes observed, and may proceed to such a degree as to lead to perforation of the muscular substance.

It has been already stated that one of the morbid effects of endocarditis is a deposit of lymph upon the inner surface of the lining membrane. Though sometimes presented as a distinct lamella, this substance more commonly occurs in the form of small *granulations*, varying in size between a pin's head and a cherry-stone. These bodies display a peculiar preference for the mitral and aortic valves, especially for their free borders, to which, when old, they adhere with considerable tenacity, though when recent, as they are then soft, they are easily detached. They are of a light pink color, whitish or yellowish, somewhat darker internally than externally, and are sometimes so clustered together as to give the surface on which they grow a rough, granulated aspect, not unlike that of a fungous ulcer, whence their name. These bodies, which are often organized, may be considered as strictly analogous to the concretions which are so frequently met with on the surface of the pericardium, pleura, and peritoneum, in chronic inflammation.

Somewhat similar to these granular concretions are those *wart-like excrescences* of the heart, the existence of which was first clearly indicated by Laennec, who has described them under the name of *globular vegetations*. Commonly of a spherical shape, they are of a pale straw color, smooth externally, and encased by a distinct cyst; their size varying between that of a pea and a pigeon's egg. These singular bodies sometimes exist in considerable numbers, both in the auricles and ventricles, to the inner surface of which they adhere by narrow footstalks, occasionally more than a third of an inch in length. The capsule, usually about a fourth of a line thick, firm and organized, is filled with a dark grayish-looking, semi-fluid substance, somewhat similar to coagulated blood, or the lees of red wine. In some instances, the surface of these excrescences is rough, mammillated, raspberry-like, or divided off into numerous facets resembling those of a crystallized garnet. They may be so closely grouped together as to present the appearance of a cauliflower.

These globular vegetations are of very rare occurrence; and their origin is still involved in obscurity. From the fact, however, that they generally coexist with chronic endocarditis and inflammation of the aorta, we may conclude that they are caused by a deposition of bloody lymph, which, assuming, perhaps in consequence of the constant movements of the circulating current, the form and color above described, in time becomes perfectly firm, dense, and organized. Corvisart supposes that they are of a syphilitic origin; but the opinion is evidently groundless.

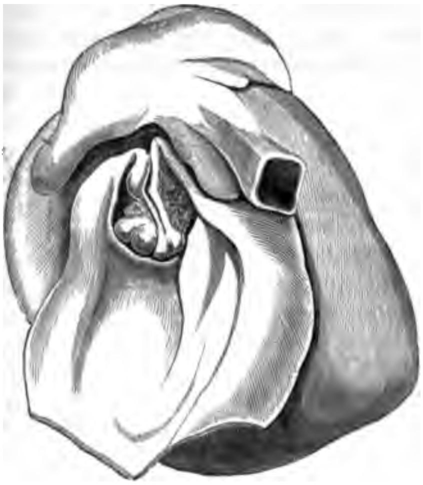
As consequences of chronic inflammation, it is by no means uncom mon to meet with *fibro-cartilaginous* and *osseous degenerations* of the endocardium. The most frequent seats of these lesions are the circular zones around the auriculo-ventricular orifices, and the adjacent valves. They may occur at all periods of life, but the age which seems to be most prone to them is between forty and sixty. Occasionally they are seen in children; and Bouillaud mentions a case in which he found them in an infant only ten months old. Like the granular and warty excrescences, these transformations are much more common in the left side of the heart than in the right, though they are not confined to it. The cause of this difference is not understood. That it depends upon some difference of organization of the endocardiac lining of the opposite chambers of the viscus cannot be reasonably doubted. The arteries, we know, are extremely liable to these degenerations; and, as their internal tunic is continued into the left cavities of the heart, whilst the right are lined by a prolongation from the internal coat of the veins, it is highly probable that the same cause which operates in the production of these lesions in the former of these structures gives rise to them in the latter, and conversely.

In the fibro-cartilaginous transformation, the endocardium is often remarkably thickened, corrugated, opaque, and of a pale milky color. Not unfrequently, indeed, the membrane is of the consistence and tenacity of tendon, or of a truly cartilaginous hardness, with a creaking sound on being cut; yet cartilage structure is not seen in them, but simply that of dense fibrous tissue. In an advanced stage, bony depositions usually occur, forming granules, patches, scales, or nodules, of various sizes, rough, opaque, whitish, or yellow. The ossifications, in most cases, assume a very irregular shape; and occasionally they penetrate deeply into the muscular substance of the heart itself. For the most part, they are seated on the valves, which are often perforated with holes, torn, reticulated, or almost entirely detached, though these appearances are by no means common.

The tissue in which the ossific deposition begins is the subserous, which binds the endocardium to the muscular substance, and which is evidently of a fibro-cellular nature, especially where it connects the folds which constitute the valves. From thence it gradually extends to the endocardium itself, and occasionally even to the muscular substance.

Among the more serious lesions resulting from cartilaginous and osseous degeneration of the valves of the heart, is the contraction of the auriculo-ventricular and arterial orifices. In its extreme degree, the point of the little finger, or even a quill, can scarcely pass. Sometimes the valves become consolidated with each other, leaving merely a small, rounded, oval, or elliptical aperture, as seen in Fig. 158, through which the blood is forced with so much difficulty that hypertrophy and dilatation, with various other diseased conditions, are sooner or later the inevitable consequences. Sometimes, again, instead of this contraction of the orifices, an incomplete closure of the valves is produced, permitting a regurgitation of the stream of blood. This insufficiency may be caused by diseases of the valves themselves, or by thickening and deposits in the papillary muscles and tendons attached to them. Cases occur in which the valves form adhesions with the walls of the heart.

Fig. 158.

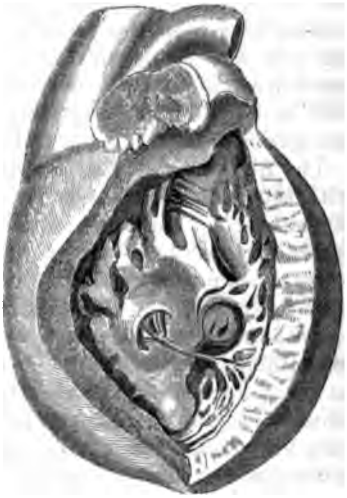


Ossification of the mitral valves. From a preparation in my cabinet.

The valves of the heart are sometimes so much dilated as to present the appearance of elongated, pouch-like projections, which may, properly enough, be styled aneurismal. The lesion may occur in any of the valves—the mitral, the aortic, and even the tricuspid—but is most common in the former, which, when thus affected, forms a sort of flask-like protrusion in the left auricle. The pouch varies in size from that of a small nut to that of a duck-egg, and is always free from coagula or fibrinous concretions, differing in this respect from the common cardiac and arterial aneurism. The valve is generally opaque, and more or less changed in its structure; in some cases it is perforated, or pierced with small holes. The effect of such a pouch is to obstruct the transmission of the blood and favor regurgitation.

*Fibrinous concretions*, Fig. 159, regarded by the older anatomists and pathologists as genuine polypes, are occasionally met with in the interior of the heart, though not so frequently as was at one time imagined. Partially or completely organized, they adhere with more or less tenacity to the inner surface of the organ, especially to the fleshy columns and tendinous cords of the valves, around which they are sometimes inextricably coiled. In their early stage they are attached solely through the medium of plastic lymph, or, what is not improbable, by the adhesive matter of the blood; after a while, however, as they increase in age, they adhere by a sort of adventitious membrane, which is ultimately transformed into short, dense, cellular tissue, the laceration of which leaves a marked roughness both on the concretion and on the endocardiac lining. The older bodies occasionally contain small, straggling vessels, some of which evidently communicate with the heart; while those of more recent formation often exhibit minute bloody points, which are probably the rudiments of arteries and veins, or, at all events, indications of incipient vascularization.

Fig. 159.



Fibrinous concretion of the heart. From a preparation in my collection.

At an advanced period of their existence, these bodies are generally of a pale buff color, pink, grayish, or slightly violet, opaque, dense, elastic, and distinctly fibrous in their texture. Their interior is sometimes softened, pultaceous, friable, or even occupied by pus; they often exhibit a lamellated arrangement; and occasionally, though rarely, they are interspersed with specks of bone, or minute vesicles, filled with serous, sanious, or semi-concrete matter.

Varying in size from a filbert to a pullet's egg, these concretions may be so voluminous as to encroach materially upon the cavity in which they are lodged. They may be confined to one chamber of the heart, or occur simultaneously in two, or more; or they may even extend into the great vessels, particularly the two hollow veins. In their form they are cylindrical, conical, pear like, flattened, reticulated, arborescent, or pediculated. In some cases they are pretty accurately moulded to the cavity in which they are situated, or to the surfaces to which they are attached.

The formation of these concretions, which are most common on the right side, cannot, I think, be altogether owing, as is supposed by some, to a retardation of the blood. This doubtless materially contributes to it; but there is reason to believe that it is greatly aided by an effusion of lymph from the inflamed endocardiac lining. Be this as it may, this substance is soon poured out, so that the adventitious body becomes gradually organized and firmly adherent to the parts with which it lies in contact.

Fibrinous growths may be detached from the valves or parietes of the heart, and be washed into distant parts of the circulation; thus leading to a blocking up of the smaller arteries and seriously interfering with the nutrition of the tissues. Those on the right side of the heart are washed into the vessels of the lungs, while those of the left side enter the systemic circulation, and are most usually carried into the cerebral arteries, or into the arteries of the kidneys and spleen.

The fibrinous concretions now described should not be confounded with the *coagula*, clots, or masses, so frequently found in the interior of the heart. The latter, which are never organized, are always formed either immediately before dissolution, in the act of dying, or within a few moments after death, before the solids and fluids have parted with their warmth. They are observed in nearly all our post-mortem examinations, in the form of dark masses which bear the greatest resemblance to the under surface of the crassamentum of the blood. In their shape they are amorphous, or similar to that of the cavity in which they are contained; they are of a black purple color, of a soft jelly-like consistence, easily detached from the parts on which they repose, and from the size of the end of the little finger to that of a pullet's egg. They are most common in the right side of the heart, from which they often extend, on the one hand, into the great hollow veins, and, on the other, into the pulmonary artery. These coagula are sometimes entirely destitute of red particles, and look very much like a mass of jelly; at other times they consist of two parts, the one dark, soft, and friable, the other white, yellowish, or greenish, and tolerably firm in its consistence.

# CHAPTER XVIII.

## NASAL, MAXILLARY, AND FRONTAL CAVITIES.

I. *Nasal Cavity.*—Deviations from the Normal Standard.—Nasal Septum.—Inflammation of the Schneiderian Membrane.—Epistaxis.—Different kinds of Polypes.—Obstruction of the Mucous Follicles.—II. *Maxillary Sinus.*—Purulent Accumulations.—Ulceration of its Lining Membrane.—Polypous Growths.—Carcinoma.—Exostoses.—III. *Lesions of the Frontal Sinus.*

I. *Nasal Cavities.*—The parietes of the nasal cavities are developed by several distinct points, the union of which is effected at the mesial line. The regularity of this formation is much influenced by that of the olfactory nerves, the imperfection of which appears to be always attended with a corresponding imperfection of the parts over which they preside. Cases are recorded in which these nerves were entirely absent, and in which, as a consequence, there was a complete deficiency both of the septum and of the floor of the nostrils.

The external nose, properly so termed, is very rarely absent as a connate vice. A much more common defect is congenital malformation of the *nasal septum.* This is generally confined to the cartilaginous portion of the septum, but may also implicate the vomer and the nasal lamella of the ethmoid. It consists, for the most part, simply in a lateral curvature, obstructing more or less the corresponding cavity, and leading to indistinct enunciation. The cartilage is occasionally thickened, perforated, or tuberose, and the external nose deformed; but these are rather accidental than necessary attendants. On the whole, it may be confidently affirmed that there are few persons in whom the part in question is perfectly vertical.

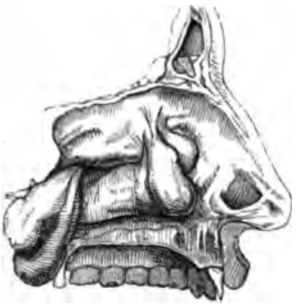
The most common disease of the Schneiderian membrane is *inflammation*, the anatomical characters of which are the same as in the rest of the mucous system. With the increased redness, there is generally, at first, a suppression of the natural secretion, which, in a short time, however, is not only restored, but becomes extremely abundant, watery, and so irritating as to excoriate the parts with which it comes in contact. When the inflammation begins to decline, as it usually does in a few days, the secretion assumes a thick, yellowish or greenish appearance, is less acrid, and gradually regains its natural standard, both as regards quantity and quality. The sense of smell is very much impaired, indeed often lost. Both cavities are usually affected, and in many instances the disease invades the neighboring parts, as the conjunctiva, fauces, and frontal sinuses. Dark-colored spots, evidently caused by the effusion of blood into the submucous cellular tissue, are sometimes observed, and the same fluid is occasionally discharged along with the altered mucous secretion. The Schneiderian membrane between these spots is of a deep florid hue, verging upon purple.

The duration of this affection varies from a few days to several weeks, when it either subsides, passes into suppuration, or assumes the chronic type. Submucous abscesses occasionally form, and are eventually followed by ulceration with an escape of their contents. More frequently, the matter is discharged along with the mucous secretion, unaccompanied by any breach of continuity. In the chronic stage of the disease, the membrane loses its spongy texture, increases in thickness and density, and can generally be easily detached, owing to the brittleness of the subjacent cellular tissue. Ulceration sometimes succeeds, and in its progress involves the osseous structure, producing what is called *ozæna*, an affection which is frequently attended with a profuse muco-purulent discharge, of a character the most intolerably fetid. In secondary syphilis, the ulceration is liable to commit extensive ravages, destroying the greater part of the nasal septum, the lateral cartilages, and the turbinated bones, thus producing the most unsightly deformity.

Hemorrhage of the nose has received the name of *epistaxis*. Owing to the great vascularity of the Schneiderian membrane, this is an extremely common occurrence, much more so than in any other part of the body, and is most frequently observed about the age of puberty. In females, it is sometimes vicarious of the menstrual flux. The blood rarely proceeds from both nostrils. In general, only a few ounces are lost at a time. When arising spontaneously, it is almost always the result of exhalation.

The Schneiderian membrane is a frequent seat of *polypes*, more so, in fact, than any other mucous cavity in the body. These growths may occur at a very early period, but are most common in young persons; they often display a malignant tendency, and are generally regenerated when extirpated. In regard to their structure, nasal polypes are divisible into three principal varieties, the gelatinous, fibrous, and vascular. The granular form, described in a previous chapter, is much more frequent in the uterus than in the nose, and does not, therefore, merit particular attention in this place.

Fig. 160.

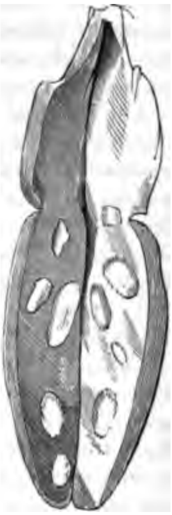


Simple gelatinous polypes, seen growing in the nasal passages.

The *gelatinous polype* (Fig. 160) generally grows from the mucous membrane over the turbinated bones; never from the median septum. As its name indicates, it is of a soft, jelly-like consistence, smooth, of a white greenish color, slightly transparent, and striated with a few scattering vessels. Most commonly it has a narrow, elongated neck, with a broad bulbous part hanging forward into the nostril. It readily breaks under the pressure of the forceps, is devoid of sensibility, and is composed of a thin, mucous pellicle, inclosing a soft cellular substance, the cavities of which are filled with watery fluid. This species of polype seldom exists singly, and is often met with in great numbers together. One nostril is very rarely affected alone. It is most common between the ages of twenty and forty, may attain a large size, and usually expands in damp, foggy weather. This variety of polype sometimes contains fibro-cartilaginous concretions, as in Fig. 161, from a specimen in my collection.

The *fibrous polype* is distinguished by the extreme firmness of its texture, which nearly equals that of tendon. Great effort is required to detach it: it exhibits a faintly striated arrangement, and is composed of whitish filaments agglutinated by a dense fibrinous substance. Although it sometimes grows in both nostrils, it almost always exists singly, and is most common in adults. When touched it bleeds profusely, and often acquires a very great bulk, protruding externally, descending into the fauces, and pressing upon the walls of the nasal cavities in all directions.

Fig. 161.



Nasal polype, containing fibro-cartilaginous concretions. From a specimen in my collection.

The third species of polype is the *vascular*, which, in comparison with the other two, is extremely rare. Young persons are most subject to it, and it occasionally grows to a very large size. Of a red florid color, it is soft and erectile, bleeds from very slight causes, the hemorrhage issuing from every part of its surface, and is composed essentially of vessels, some of them of considerable magnitude. It is rarely of a malignant character, and does not often return when extirpated.

Of the different species of polypes now described, the fibrous is by far the most liable to take on malignant action. When thus affected, it becomes extremely friable, bleeds profusely when injured, and often assumes the character of genuine fungus hæmatodes, encroaching without limitation upon the bones of the nose and face, and gradually but surely sapping the foundations of life. The malignant growth exudes a fetid, purulent, or bloody matter, is attended with severe pain, usually occurs late in life, and invariably returns when extirpated. Small cysts, containing a glairy, mucous fluid, are sometimes found in these polypes; and in a specimen in my possession from the nose of an elderly gentleman, there are numerous fibro-cartilaginous concretions, of the same nature exactly as those found in other organs.

There is a disease of the nasal cavities, which, as it is often mistaken for polypes, requires brief notice in this place. It is observed chiefly in weakly children and in females of a relaxed constitution, and consists in an elongation of the Schneiderian membrane, produced by an effusion of sero-plastic matter into the subjacent cellular substance.

A tumor is thus formed of a red vascular appearance, and of a soft spongy consistence. The parts on which it grows are the turbinated bones, of which the superior is more frequently affected than the inferior. Both nostrils are sometimes involved. The tumor may exist for a long time, but is always amenable to proper treatment.

The mucous follicles of the nose, like the same structures in other situations, are liable to obstruction of their orifices, leading to the formation of *encysted tumors*. They have an irregular, bulbous shape, a light grayish color, and a soft, gelatinous consistence, hanging within the nose like so many little bladders. No pain attends these tumors; they easily break under pressure, discharging a thin, glairy fluid, like the white of eggs, and are extremely apt to reappear after they have been removed, either at the same place, or in the parts immediately around.

Calculi of the nasal fossa, technically called *rhenolithes*, are extremely rare, and have hitherto been observed chiefly in the inferior meatus, although they may occur in any portion of the nose. Varying in size from that of a pea to that of a Lima bean, they are of an irregular figure, round, ovoidal, or triangular, of a grayish, whitish, or brownish color, and of a firm consistence, not unlike that of an ossified lymphatic ganglion. When large, they are usually solitary, while, under opposite circumstances, their number may be considerable. They are generally formed around a foreign substance, as a piece of bone, a cherry-stone, or the fang of a tooth, and they are composed essentially of carbonate and phosphate of lime, cemented by a small quantity of animal matter. The symptoms which they produce are those of mechanical obstruction, attended with a fetid muco-purulent discharge. They may seriously obstruct the nasal fossa, push the septum to one side, and cause ulceration of the nasal walls.

II. *Maxillary Sinus.*—The maxillary sinus is subject to different maladies, the most common of which is *inflammation* of the lining membrane, occasioned by cold, the irritation of a carious stump, or extension of disease from the nasal cavities. The anatomical characters of this lesion do not differ from similar affections in other parts of the mucous system. The purulent matter, which is often quite abundant, is of a thick, cream-like consistence, and almost always highly offensive, apparently from its long sojourn in the antrum. When the inflammation is protracted the lining membrane becomes thickened, the natural outlet is partially or entirely closed, the dimensions of the sinus are increased, ulceration is set up, and great mischief is frequently done to the maxillary bone.

When the natural outlet of this cavity is shut, an immense accumulation of mucous fluid occasionally takes place, forming a tumor which exhibits all the outward features of carcinomatous disease. In this affection, usually called *dropsy* of the maxillary sinus, the cavity is brought in the same relations as a mucous crypt laboring under an obstruction of its orifice. The normal secretion still goes on, but being unable to find an outlet, it is pent up, and thus forms a species of encysted tumor. The fluid is usually of a thick, glutinous consistence; but may be thin and glairy, like the white of an egg, or the contents of a ranula.

*Polypes*, of the same nature as those of the nose, sometimes grow in the antrum. They are generally attached to the mucous membrane by a pretty broad base, and increase with more or less rapidity, until they fill the whole chamber. In time, they encroach upon the surrounding parts, as the eye, nose, mouth, and face, thrusting them out of their natural position, and thus occasioning considerable deformity. In color, they are ordinarily florid, from their excessive vascularity; and in consistence they vary from the softness of flesh to the firmness of fibro-cartilage, and even bone. A profuse discharge of fetid sanious matter usually accompanies this disease, and the part is the seat of constant pain, commonly of a dull, aching character.

*Carcinoma* of this chamber is generally, if not invariably, of the encephaloid kind. The young are most obnoxious to it, but the old are by no means exempt from its attack. The disease usually begins in the lining membrane, or in the submucous cellular texture, and gradually invades the osseous framework of the face, leading finally to the most hideous deformity. In a case recently under my observation, in a man fifty-seven years of age, the tumor, although scarcely of eleven months' standing, was of enormous size, encroaching, on the one hand, upon the roof of the mouth, and, on the other, upon the nose, eye, and forehead. The malady is generally rapid in its progress, and its tendency is always unfavorable. When removed with the knife, it is sure to reappear at the cicatrice, or in some neighboring part.

*Exostoses* occasionally grow in the antrum. In a specimen in my collection there are from eight to a dozen of these excrescences, varying in volume between a mustard-seed and a grain of wheat, which they also resemble in shape. In rare instances, these exostoses acquire a very large magnitude, so as to fill not only the antrum, but encroach very much upon the neighboring organs, as the eye and even the brain.

III. *Frontal Sinus.*—It is seldom that the frontal sinus is the seat of disease. This cavity is lined by a reflection of the pituitary membrane of the nose, in the lesions of which it sometimes participates, especially in the catarrhal affections which are so common in this country. The inflammation occasionally terminates in the effusion of pus, which usually finds a vent through the nostrils, though in a few rare instances it works its way out through the bones and soft parts, leaving a troublesome fistulous opening. When chronic, the disease is generally attended with thickening of the mucous membrane, together with a discharge of thin, fetid matter, and a diminution of the sense of smell.

*Calculi*, of a grayish color, irregular shape, and of the size of a pea, have been observed in the frontal sinus, but their occurrence is extremely rare. Their number seldom exceeds three or four, and they are composed principally of phosphate and carbonate of lime, cemented by a little animal matter. Of their mode of formation nothing is known.

*Polypes*, similar to those of the chamber of Highmore, have been met with in the frontal sinus; and an instance has been recorded in which this cavity contained an enormous hydatid. Exostoses are also sometimes developed in it; and, in tertiary syphilis, its lining membrane occasionally becomes the seat of protracted suppuration and ulceration. In the latter case, the disease may extend to the anterior wall of the sinus, and thus lead to the formation of an intractable fistule.

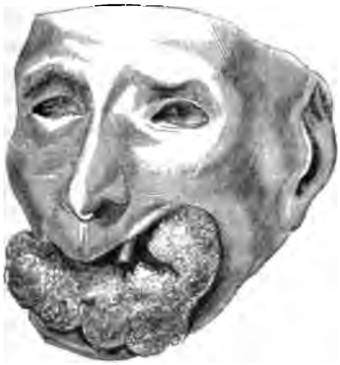
## CHAPTER XIX.

### MOUTH, PHARYNX, AND ŒSOPHAGUS.

I. *Diseases of the Lips.*—Carcinoma, Encysted Tumors, and Congenital Fissure.—Malformations of the Jaw.—II. *Glossitis.*—Ulceration, Hypertrophy, and Cancer of the Tongue.—Congenital Deficiencies.—III. *Salivary Glands.*—Parotitis.—Atrophy and Hypertrophy.—Scirrhus.—Calcareous Concretions.—Ranula.—Fatty Degeneration.—Morbid Alterations.—IV. *The Teeth.*—Caries.—Gangrene.—Inflammation of their Internal Membrane.—Fungous Tumors.—Exostoses.—Denuding Process.—Deposits of Tartar.—Congenital Vices.—V. *The Gum.*—Liability to Inflammation.—Epulis.—Ulcerative Absorption.—Mortification.—Alveolar Abscess.—VI. *Diseases of the Tonsils.*—VII. *The Soft Palate and Uvula.*—VIII. *The Pharynx.*—Diphtheritis.—Polypes.—Sacculated Condition.—IX. *Œsophagitis.*—Ulceration.—Softening.—Stricture.—Scirrhus.—Laceration.—Congenital Malformations.

I. *Lips.*—The lips afford a subject of interest to the morbid anatomist chiefly on account of carcinoma, encysted tumors, and congenital malformations. Cancer, of the epithelial kind, is sufficiently common here, especially in elderly subjects, and usually begins in the follicular structure of the part, which becomes hard and thickened, and soon tends to ulcerate. The sore thus formed is often very deep, with fiery and everted edges, and gives vent to a thin, sanious, and eroding fluid. When removed by excision, the disease commonly returns. If permitted to progress, it gradually destroys the lip, and involves the gum, together with the periosteum, and the substance of the jaw.

Fig. 162.



Epithelial cancer of the lower lip, in an advanced stage. From a preparation in my collection.

When the orifice of one of the labial glands becomes accidentally obstructed, mucus accumulates in it, converting it into an *encysted tumor.* The swelling seldom exceeds a hazelnut, but I have found it as large as a small almond. Its form is usually spherical, and its appearance semi-transparent, its contents being thick and glairy, like the white of eggs.

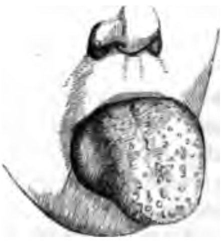
The congenital malformations of the lip are usually comprehended under the title of *hare-lip*, from their supposed resemblance to the lip of the hare. The most simple form in which it is presented is that of a fissure, extending from the border of the lip to its connection with the gum. Generally seated to one side of the mesial plane, more frequently on the left than the right, it exists either by itself, or is complicated with malformation of the jaw, palate, or nose, or of all these parts together. The margins of the abnormal cleft are more or less rounded off; and, as they are covered with mucous membrane, they are usually of a reddish color. In double hare-lip there are two such fissures, separated by an intermediate portion of lip, which varies much in size and shape, being sometimes broad and quadrangular, but more commonly narrow, elongated, and tit-like. The cleft, whether single or double, is more or less oblique. The defect always depends upon an arrest of the natural development of the part concerned.

"The malformation to which the upper jaw is liable consists in a projection of the central part that holds the cutting teeth, forming a tumor from which the teeth grow out at a right angle to their ordinary direction. In most cases of this kind, the projection comprehends an equal portion of both superior maxillary bones, the portion, namely, which, in the lower animals, is occupied by two distinct pieces, the *ossa incisiva*. It forms a round knob, connected by a narrow neck to the septum of the nose, covered with a firm substance, similar to the gum, and having at its anterior part a similar shaped but smaller sized appendage, which seems to consist of the tissue that should have constituted the lip. The fissures on each side of this knob meet together behind it, and are there continued single through the palate backwards. Instead of this conformation there is sometimes merely an overlapping of one edge of the split gum over the other, and the degree to which the projection thus formed takes place is extremely various."

II. *Tongue.*—The tongue is liable to inflammation, suppuration, ulceration, hypertrophy, cysts, and cancer.

*Glossitis* (Fig. 163) may exist as an idiopathic affection, but is most generally induced by salivation, by mechanical injury, steam, hot water, or corrosive substances The organ is extremely painful, and may swell so enormously as to threaten the patient with suffocation; all its vessels are engorged with blood; the papillæ are greatly enlarged; and its surface, at first of a bright red, is soon coated with viscid mucus, or, when the inflammation runs high, even with lymph. Now and then the disease is limited to one half of the tongue, the raphe forming a pretty distinct line of demarcation between it and the unaffected side. Glossitis may terminate in resolution, suppuration, or gangrene. The disposition to disappear is sometimes manifested as early as the third day, but mostly not until

Fig. 163.



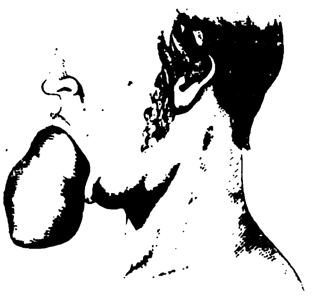
Glossitis.

about the sixth. When matter forms it is generally deep-seated, and requires free incisions for its evacuation. The termination of glossitis in gangrene is extremely rare, being noticed chiefly in persons of a debauched habit and worn-out constitution.

The mucous membrane of the tongue and cheek is liable to several forms of *ulceration.* In psoriasis there are whitish excoriated patches, not unfrequently half an inch in diameter; and in children nothing is more common than to see these parts studded with small milky-looking vesicles. These blebs, technically called *aphthæ,* are of an irregularly spherical figure, and vary in size from a pin's head to that of a split pea. Their contents are chiefly of a serous nature. Aphthæ are generally connected with gastro-enteric irritation; and there is reason to believe that they often extend through the œsophagus, as far as the cardiac extremity of the stomach. In several instances, however, in which I made a careful inspection with a view of ascertaining this point, I failed in tracing the vesicles beyond the fauces, although the tongue, the inside of the cheeks, and the roof of the mouth were literally covered with them.

Flat, shallow ulcers, with hard and thickened edges, are occasionally observed on the tongue, cheeks, and fauces, in secondary syphilis, and in persons who have been excessively salivated. The parts are foul and ill-looking; the saliva acrid and abundant; the gums spongy, and disposed to ulcerate.

Fig. 164.



Hypertrophy of the tongue.

*Hypertrophy* of the tongue (Fig. 164) may be limited to its muscular substance, to its mucous covering, or to its papillæ. The first variety, to which the term general may be applied, is frequently congenital, but it also occurs in children and adults, either as a consequence of inflammation, or without any assignable cause. It takes place in both sexes, but in what ratio has not been ascertained. The volume of the affected organ varies in different cases, from slight increase of the normal bulk to the most hideous development. As the hypertrophy progresses, the tongue protrudes beyond the mouth, being preternaturally tense and rigid, rough, and even mammillated, of a dark color, and constantly covered with a tough, tenacious mucus. In cases of long standing the extra-oral portion is often from three to four inches long, and proportionably broad and thick. The part within the mouth frequently retains, in a remarkable degree, its normal appearance, perhaps the only change being a certain amount of discoloration of the mucous membrane along with considerable hypertrophy of the cuticular papillæ.

These enlargements of the tongue are sometimes remarkably vascular, being pervaded by plexuses of dilated vessels, and subject to temporary erections, from the preternatual influx of blood. Dissection shows that the fleshy fibres have lost their normal color, and that they are converted into a dense, semi-cartilaginous substance, with scarcely a trace of the primitive structure.

When the hypertrophy is unusually great, the weight of the tumor presses the incisor teeth out of place, giving them a horizontal direction; the mouth is enormously increased in size; the lower lip is almost completely everted; and there is a constant dribbling of saliva. In congenital cases, or in those beginning in early life, the branches of the jaw-bone are often very short, and the temporo-maxillary articulation is occasionally partially anchylosed. Ulcerations of the tongue and membrane, and inordinate accumulations of earthy matter are common accompaniments of the malady.

With respect to the *mucous membrane*, the hypertrophy is usually limited to one or more points, though it may extend over the entire organ. The affected part varies in thickness from the twelfth to the third of an inch, and exhibits a rough, grayish appearance, the prominences being occasionally divided by deep fissures. The enlarged parts are almost insensible, and the sense of taste is usually much impaired.

The *papillæ* on the dorsal surface of the tongue have a narrow base, and a broad, mushroom-like head. From derangement of the stomach, or from local injury, they are capable of becoming considerably enlarged, so as to form tumors of a deep florid color, which may be mistaken for cancerous excrescences From these, however, they are readily distinguished by there being no real ulceration of the tongue, and by the absence of any decided pain. The size which such tumors may acquire varies from that of a pea to that of a cherry.

Still more rare than the lesion just described is *atrophy* of the tongue. This is generally associated with inflammatory irritation, and may reach such a degree as to leave merely a dense, whitish mass, with scarcely a vestige of muscular tissue.

There is a singular disease of the tongue, which consists of very minute semi-transparent *vesicles*, occupying the muscular substance of the organ, the mucous membrane of which they not unfrequently elevate in the form of little tumors. The precise nature of these vesicles is not understood. In a case mentioned by Mr. Earle, they grew in clusters, and were so sensitive as to bleed profusely on the slightest injury. The clusters, in some places, were separated by deep clefts, which discharged a fetid, irritating sanies.

This organ is not unfrequently the seat of *cancer*, a disease which, though most common in old persons, is sometimes observed in the young. It commences in the form of a hard, inelastic, puckered tubercle, situated towards the anterior part of the tongue, by the side of the mesial plane. The ulcer which follows is excavated, foul, and uneven; the edges are thick and contracted; the base and surrounding substance hard and gristly. In time the disease affects the gums, teeth, jaws, and cheeks, causing frightful ravages. The breath is intolerably fetid; the pain is sharp and darting; the neighboring lymphatic ganglions swell; and profuse hemorrhages supervene from the ulceration of one or more vessels. In some instances, the disease begins in a fungous excrescence, at the side of the tongue, which extends rapidly over the surface, and assumes all the characters of encephaloid. In whatever manner it may appear, there is reason to believe that carcinoma is originally located in the follicular structures, from which it gradually spreads to the other tissues.

Finally, the tongue is liable to congenital *malformations*. Thus, it may be bifurcated at the tip, as in the snake and lizard; be extremely small, and nipple-shaped, as in parrots; be double, or even entirely absent. The frænum is sometimes too long, or too short, or unusually thick, and of a dense, fibrous consistence.

III. *Salivary Glands.*—All the salivary glands are not equally liable to morbid alterations. The parotid is much more frequently affected than the others, the disease to which it is most subject being *mumps*, an infectious, inflammatory complaint, occurring sometimes endemically. Both organs are usually involved. The swelling, which is often considerable, reaches its height about the end of the fourth day; after which it gradually subsides, and in a week from the time of the invasion is entirely gone. One of the most singular features of the disorder is its liability to be translated to other organs, as the testicle and female breast. It rarely occurs more than once, and youth is its favorite period of attack.

However induced, the anatomical characters of the disease are generally the same; that is, the substance of the affected gland is preternaturally red, its density is augmented, its lobules are rendered more distinct, and the connecting cellular tissue is infiltrated with serosity. In severe cases, fibrin and blood are effused, giving the part a bloodshot appearance. Added to these phenomena, the capillary vessels, both arterial and venous, are excessively engorged, and the minute excretory ducts are so much compressed as to be no longer permeable to the most diffusible injecting matter. The salivary fluid is also more or less altered. When the inflammation is at its height, the secretion is very much diminished, or almost entirely suspended; after a short time, however, it is restored, and is then often discharged in immense quantities, as is exemplified in mercurial salivation. In this affection, which appears to be propagated from the gums and cheeks, as there are always manifestations of it there before it involves the glandular structures about the jaws, the salivary fluid is remarkably thick, tenacious, and of a strong, disagreeable taste. Much of this is owing, doubtless, to the follicular secretion of the mouth, which, under such circumstances, is of a very fetid quality, and poured forth in great abundance.

Parotitis may terminate in *suppuration*. Of this I have witnessed a number of cases, in two of which an opportunity was afforded me of making an autopsic inspection. In one, both glands were much enlarged, unnaturally dense, of a grayish, gristly appearance, and pervaded throughout by purulent matter, collected, here and there, into little abscesses, the largest of which did not exceed the volume of a hazelnut. The pus was white, thick, and tenacious, like that of a scrofulous lymphatic ganglion. The weight of the right parotid was one ounce and two drachms; of the left, one ounce and one drachm.

The glandular substance was very little injected, a small straggling vessel only being here and there perceptible. The patient, who was sixty-eight years of age, died of disease of the liver and duodenum. The parotitis came on ten days before death; and ran its course without the slightest pain.

In the other case, the glands were also very much enlarged; the connecting cellular tissue was remarkably congested and even ecchymotic; and the matter, which was of a pale yellowish color, was contained in an immense number of little abscesses, not larger than a mustard-seed, and evidently seated in the rootlets of the Stenonian duct. The patient, a man about thirty-two years of age, died of bilious fever, and had been salivated.

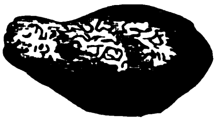
*Gangrene* may seize on the parotid, and proceed until it has entirely destroyed its substance. This termination, however, is extremely rare, and is observed chiefly in cases in which the surrounding textures are extensively involved by the inflammation.

The salivary glands, especially the parotid, are subject to *atrophy*. This is usually induced by some morbid growth in their immediate vicinity, which, by causing the absorption of their substance in proportion to its own enlargement, at length usurps their place. *Hypertrophy*, an affection much more common than atrophy, is generally associated with induration, the effect of which is to render the glandular structure hard, dense, and sometimes almost of a gristly consistence.

True *scirrhus* is occasionally met with in the parotid, as are also encephaloid and melanosis. The occurrence, however, of these malignant growths is rare, and is chiefly witnessed in persons past the prime of life. The size of the organ, in these affections, is sometimes surprising. In a case in which it was removed by Dr. Prieger, of Germany, on account of a carcinomatous disease, it weighed two pounds and three-quarters. The patient was a female, thirty-five years of age. Tubercles have never, I believe, been observed either in this or in the other salivary glands.

I am not aware that authors have recorded any examples of *fatty degeneration* of the salivary glands; but an interesting case of this kind fell under my observation, many years ago, in a man forty-two years of age. The disease involved the right parotid, which was enlarged to nearly three times the normal bulk, and had been gradually coming on for several years, unattended with pain or tenderness on pressure. After the extirpation of the organ, which was successfully accomplished by my friend and former colleague, Professor Willard Parker, now of New York, it was found to be completely transformed into adipose matter, quite greasy to the touch, remarkably friable, and of a pale bluish color, not unlike the buffy coat of the blood. The granular texture was still recognizable, but the connecting cellular tissue appeared to be entirely destroyed. When pressed between the fingers, a clear oily fluid oozed out, which, after the gland had been immersed for some time in alcohol, collected in considerable quantity on the surface of that liquor. A similar transformation, as will be shown hereafter, is occasionally witnessed in the pancreas, which bears so close a resemblance to the parotid that it has been described by many under the name of the salivary gland of the abdomen. Whether the sublingual and submaxillary glands are susceptible of a like change, I am not able to say, as there are no cases of it on record.

Fig. 165.



Salivary calculus. From a preparation in my collection.

The ducts, both of the parotid and submaxillary glands, are sometimes the seat of calcareous concretions, named *salivary calculi*. Their volume varies from that of a clover-seed to that of a large almond. Their number is usually small. They are of a pale yellowish color, and of an oval shape, with a finely tuberculated surface. Their composition is phosphate and carbonate of lime, agglutinated together by a small quantity of animal matter. A concretion of this description from the left submaxillary gland is seen in Fig. 165. It is represented of the natural size and shape.

The principal disease of the sublingual gland is *ranula*, generally supposed to depend upon the dilatation of one of its ducts, but in reality, an encysted tumor. It is usually occupied by a thick, glairy fluid, like the white of eggs, but which is sometimes watery, or of a pultaceous consistence: occasionally, it resembles the synovial liquor of the joints, and contains particles of gritty matter, probably a mixture of phosphate and carbonate of lime. The size of the tumor varies from that of a pea to that of the fist; its form is irregularly oval, and its parietes are thin, and for the most part translucent. The submaxillary gland is sometimes similarly affected.

Finally, the salivary, like the other secretions, is liable to various morbid alterations. Thus, it may be diminished or increased in quantity, puriform, bloody, acid, alkaline, saline, calcareous, or fetid. In certain diseases, as in fevers and inflammations, the salivary secretion is sometimes nearly entirely suspended, the mouth being dry, and the thirst more or less urgent. In nervous affections, on the other hand, it is often very much augmented, as well as remarkably changed in its properties. In hydrophobia it is poisonous, and capable of communicating the disease.

IV. *Teeth.*—A tooth taken from the jaw of a living person, and immediately replaced in its former socket, will contract adhesions to the raw surface, and be permanently retained. The singular experiment of Mr. Hunter is well known. This ingenious physiologist transferred a tooth from its cavity into an incision in the comb of a cock, to which it became so firmly united that, on killing the animal some time subsequently, and injecting its head, the fluid ran freely into the internal membrane of the transplanted organ. It was upon a knowledge of this fact that was founded the disgusting practice, so common in the last century, of extracting teeth from one person and inserting them in the mouth of another.

Experience has shown that the root of a tooth, when fractured, may reunite, the process being similar to that of a broken bone. The blood which is poured out at the moment of the accident being absorbed, lymph is effused; this is soon succeeded by cartilage, and this, in time, by osseous substance.

The most common disease of the teeth is *caries*, a lesion which is strictly analogous to ulceration of the osseous tissue. Commencing always in the bony substance of the crown, immediately under the enamel, it presents, at first, the appearance of a minute, opaque, brownish speck, which gradually extends towards the centre of the organ, assuming at length a blackish color, and becoming so soft and brittle as to be crushed on the slightest touch. Thus a large cavity is exposed, which perhaps had not previously been suspected to exist. As it advances, the disease frequently destroys the entire crown, or converts it into a dark, pulverulent substance, without any trace of its primitive texture. The roots are usually the last to decay, and it often happens that they retain their vitality long after the other parts have perished. In this condition, however, they act as extraneous bodies, exciting ulceration of the gum and alveolar processes, whereby they lose their connection, and are finally dislodged.

Figs. 166, 167, and 168 exhibit some of the more ordinary forms of this disease.

Fig. 166.

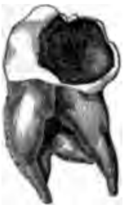


Fig. 167.

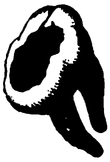
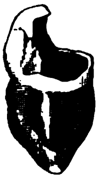


Fig. 168.



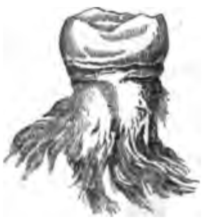
The teeth most liable to this disease are the last grinders, probably from some defect inherent in their constitution in consequence of their late development. The upper central incisors are also frequently affected, as are likewise the first molar teeth, particularly those of the under jaw. The lower incisors, on the contrary, are rarely attacked. Every part of the crown appears to be equally liable to caries; and it often happens that the disease begins simultaneously at several points.

Persons of a tubercular constitution are very subject to this species of decay, which often sets in at a very early period of life, and proceeds until nearly every tooth is destroyed by it. The upper incisors of children are frequently attacked in this way within a short time after their appearance, and occasionally, indeed, when they are still partially covered by the gum. There is sometimes an hereditary proclivity to this disorder; as is evinced by the fact that it often occurs in a considerable number of members of the same family, and in the children of parents who had been similarly affected.

*Gangrene* of the teeth is usually caused by external violence, the effects of mercury, or a syphilitic taint of the system. In scurvy, too, they often lose their vascular connection, and ultimately perish. When affected in this way, they assume a dull, yellowish, brownish, or blackish appearance, and finally drop out of their sockets. In most cases, death is universal; not limited to particular parts of a tooth.

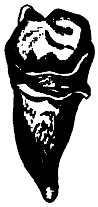
The *lining membrane* of the teeth is occasionally affected with inflammation, the other anatomical elements of these organs being apparently in a sound state. The disease, if allowed to go on, almost always leads to the formation of an alveolar abscess. In other cases, there is a pretty abundant deposit of fibrin, both within the canal of the affected organ and around its roots, the latter of which exhibit a singular shreddy aspect, the plastic, organized lymph hanging from the thickened periosteum in all directions (Fig. 169). Occasionally, again, though this is not very common, purulent matter is poured out, forming an abscess analogous to what is sometimes observed in the interior of a bone. When the quantity of fluid is considerable, it is very apt, from its confined situation, and consequent pressure, to produce mortification of the lining membrane, with absorption of the parietes of the cavity. By this means the pus gradually escapes at the extremity of the fang, the foramen of which is much enlarged. Ulcerative inflammation is next set up in the alveolar process and gum, which continues its ravages until the inclosed matter, now extremely offensive, obtains an outlet, the affected tooth meanwhile losing its vitality, and presenting a dull yellowish, dark, or brownish color.

Fig. 169.



The exposure of the internal membrane from gangrene, fracture, or other causes, not unfrequently leads to the formation of *fungous tumors*, varying in volume between that of a pin-head and an ordinary pea. (Fig. 170.) Of a pale reddish color, they are of a soft, fleshy consistence, and are essentially composed of a plexus of vessels, connected together by delicate cellular substance, and traversed by minute nervous filaments. From their excessive vascularity, these growths are liable to bleed upon the slightest touch; and, although they are occasionally as insensible as healthy gum, yet in the majority of cases they are the seat of the most exquisite pain. The period required for their development varies from a few months to several years; but, from the great suffering which they induce, they are seldom permitted to remain for any length of time. They appear to arise, for the most part, from the lining membrane of the fang, from which they proceed more or less rapidly until they fill the whole cavity of the organ. Occasionally, there is reason to believe that these growths spring directly from the dental nerve, which becomes exceedingly vascular, elongated, and thickened. The teeth most frequently affected with this disease are the central incisors and the large grinders. Such a tumor is occasionally the seat of periodical hemorrhage, apparently vicarious of the menses.

Fig. 170.



Inflammation of the *dental periosteum* is sufficiently common. It is characterized, anatomically considered, by an increase of vascularity, and by a softened, pulpy condition of the membrane, and often terminates in suppuration and abscess. As the disease progresses the periosteum is detached at the most highly inflamed part, which is usually around the extremities of the fang, and the sac thus formed becomes the receptacle of the pus. The denuded portion of the tooth loses its vitality, thereby adding to the irritation of the socket, which, in consequence, takes on ulcerative action, followed by a fistulous opening, and the escape of the accumulated fluid. If the tooth be extracted after this occurrence, the sac will often come away in the form of a red fungous mass, not unlike a small polype. Figures 171 and 172 are excellent illustrations of different forms of the sac in alveolar abscess.

Fig. 171.

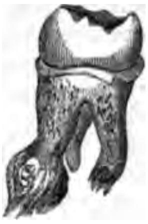
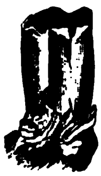


Fig. 172.



When we consider that, with the exception of the enamel, the teeth are essentially composed of the same anatomical elements as the bones, it is not surprising that they should be the seat of *exostosis*. The substance which is thus added differs from the pre-existing structure principally in being of a denser consistence, and of a yellowish transparent aspect, not unlike chalcedony. The deposit ordinarily takes place at the root of the organ, but in some instances it affects the body, and it may even extend as high up as the crown. Analogy would lead us to infer that the new matter is furnished exclusively by the vessels of the periosteum; and this, doubtless, is true in the generality of instances. The progress of this disease is usually very tardy, a long time elapsing before the bony tumor acquires much bulk.

There is a singular affection of the teeth, described by dentists under the name of " the denuding process," the precise nature of which is still unexplained. It consists in the gradual removal of the enamel, generally without the slightest discoloration or diseased appearance. It is most frequently observed in the incisors, especially the inferior, but occasionally attacks the whole dental arch. As the denuding process advances, the crown of the tooth is slowly worn away, the enamel first disappearing at the top, and subsequently at the sides, until the greater part is removed. The organ, in the meanwhile, changes its color, gradually becoming more yellow, and finally, when the enamel is completely destroyed, assuming a brownish aspect. The most curious circumstance in the history of this lesion is the beautiful provision by which the cavity of the tooth is protected from exposure. This consists in a deposit of new bony matter, perfectly hard and solid, but so transparent that nothing but the closest examination could detect it. Thus a sort of permanent plug is formed, which effectually defends the delicate structure within, and which exactly resembles the transparent layers of an ægose pebble, surrounded by a more opaque mass. In what this lesion essentially consists it is not easy to determine, though it is not improbable, I think, that it depends upon some original or acquired defect of the enamel, whereby it is made to yield more readily to the mechanical attrition to which the teeth are constantly subjected. It is witnessed at nearly every period of life, but is by far most common in old people.

The teeth, from want of cleanliness, as well as other causes, are very apt to become the seat of *calcareous concretions.* When first deposited, this substance possesses the character of a soft, friable, porous paste, which by degrees acquires the consistence of hardened mortar, and often scales off in large masses, having the shape of the organ around which it was formed. Its usual color is a dull whitish yellow, though in some cases it is dark brown, blackish, or even greenish. The specific gravity of this matter is 1.571. From the analysis of Pepys it would appear to be composed principally of phosphate of lime, in association with a small quantity of cartilage and fatty substance. This matter has also been examined by Berzelius, who states its composition to be as follows:—

| | |
|---|---|
| Salivary matter | 1.0 |
| Salivary mucus | 12.5 |
| Earthy phosphates | 79.0 |
| Animal matter dissolved by muriatic acid | 7.5 |
| | 100.0 |

The accumulation of this substance often takes place with great rapidity, so that in a short time the dental arches are almost completely incrusted with it. Calculous and gouty persons are particularly liable to it; and it is also frequently witnessed in lying-in females. It is ordinarily deposited, at first, around the necks of the teeth, just beneath the free margin of the gum. As it increases in quantity, it produces the most disastrous effects, exciting irritation in the soft parts, which leads to absorption of the gum and alveolar processes, until the teeth, deprived of their support, are loosened, and at length drop out.

It has been supposed that this matter is derived directly from the mucous secretions of the mouth, vitiated by chronic irritation; but the more plausible opinion is, that it is furnished solely by the salivary glands, being held in solution by the fluid which it is the office of these organs to elaborate. This view of the subject is not only supported by the analogy which obtains in the formation of urinary calculi, but by the fact that this substance is always deposited in greatest abundance upon the superior grinders and the inferior incisors, teeth which lie in the immediate vicinity of the orifices of the salivary ducts, and also by the circumstance that it is composed of the same elements as the fluid just referred to.

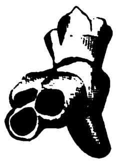
The teeth experience important changes in consequence of age. As life advances they gradually lose their whiteness, and assume a peculiarly yellowish tint, which is often remarkably conspicuous in old people. They become likewise more brittle, and the enamel exhibits an irregularly abraded appearance. These changes are produced by certain alterations which take place in the anatomical constitution of the teeth, from the obliteration of their vessels, and their consequent diminished supply of blood.

The temporary teeth are surrounded each by a membranous cyst, which often inflames during dentition, and thus gives rise not only to much local uneasiness, but occasionally to great disturbance in other organs, especially the stomach and bowels. The gum at the same time becomes red and tumid, and there is generally an inordinate secretion of salivary fluid. When the tooth is fully formed, the sac is no longer of any use, and is therefore gradually absorbed.

Lastly, the teeth are liable to certain congenital *vices* in regard to their development, situation, and direction. In persons affected with hare-lip and cleft palate, the upper incisors are almost always badly formed, and thrust out of their natural position. Instances also occur in which some of these organs are firmly united together by osseous matter; and Albinus has related a case where the crown of the eye-tooth was turned towards the maxillary sinus, the situation of the fang being reversed. A case precisely similar occurred in my practice some years ago, in a young lady of twenty-three. The irritation which it caused in the jaw gave rise to a tumor requiring surgical interference.

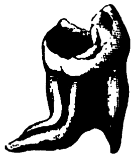
Fig. 173 represents the wisdom tooth of the upper jaw of the right side, inseparably fused with the fangs of the last grinder, the parts looking as if they had been ingrafted upon each other. The tooth was situated horizontally under the gum, by which it was nearly concealed. It was extracted from a woman, aged thirty, by Dr. Somerby, of Louisville, to whom I am indebted for the specimen.

Fig. 173.



Cases occur in which the fangs of the teeth are very crooked, thus opposing a great obstacle to their extraction. Such a malconformation is represented in Fig. 174, where one of the roots is nearly horizontal. In a second series of cases the roots are all remarkably divergent; while in a third they are, perhaps, all soldered together by osseous matter. I have several specimens in my collection in which the teeth are inseparably connected, in a similar manner, with the walls of their sockets.

Fig. 174.



V. *Gums.*—Another structure which requires brief notice is the gum. Of ordinary inflammation, to which the gum, in common with the rest of the mucous system, is liable, it is not my intention here to speak; but there are several lesions which are either peculiar to this situation, or which are produced by irritation of diseased teeth, of which it will be necessary to treat with some degree of minuteness.

The most frequent lesion of the gum is *ulceration*, produced by the accumulation of tartar around the necks of the teeth. The pressure that is thus exerted excites inflammatory action, leading to great thickening, sponginess, and discoloration of the gum, with erosion of its substance. In this way the teeth are entirely denuded at their necks, in consequence of which they often drop from their sockets, or become so loose as to be useless.

The gum, in common with the rest of the mucous membrane, is liable to sloughing, from excessive mercurial action, and probably also from causes which exert their influence chiefly through the constitution. Of this nature appears to be that variety of mortification which has been so ably described by the older writers under the name of "black canker," and by Dr. Coates[1] under that of the "gangrenous ulcer" of the mouth. Although it may begin at any part of the mucous membrane, yet, in by far the greater number of cases, it makes its appearance at the edges of the gum, over the neck of the central incisors of the lower jaw, in the form of a whitish, cineritious, or reddish ulcer, which varies in diameter, from half a line to the eighth of an inch. In this state, the disease may continue for several weeks, or even months; but more commonly it extends its ravages, affecting either a large portion of the dental arches, or passing down in the direction of the sockets of the teeth, which, together with their periosteum and the alveolar processes, are gradually deprived of their vitality. The soft parts, in the meanwhile, assume a dirty blackish appearance; and, on being detached, they leave a ragged, sloughing ulcer, which is the seat of a foul, sanious discharge, of so excessively acrid a nature as to excoriate whatever texture it may happen to come in contact with. In this manner, the disease appears to be frequently propagated to the mucous membrane of the cheeks and lips, where it generally spreads with great rapidity, until the parts are completely perforated, or a black gangrenous spot manifests itself upon the external surface.

The true pathology of this disease is still enveloped in obscurity. It is almost wholly confined in its attacks to young, weakly subjects, and occasionally displays an endemic tendency. Out of 240 children observed by Dr. Coates in the Philadelphia Asylum, upwards of 70 were more or less affected with the primary ulcer at one time. In the early stage of the complaint there is little or no pain, the system is free from excitement, and the appetite and strength are scarcely at all impaired. When the sloughing process, however, has fairly commenced, the child suffers much local distress, and is harassed with constant fever. Dissection has thrown no light on this singular variety of gangrene.

The gums are subject to *congenital hypertrophy*, sometimes giving rise to remarkable deformity of the mouth and lips. The only case of the kind that I have ever seen came under my observation in 1855, in a lad ten years old, remarkable for his stunted development, ill-shaped head, and large abdomen. The morbid mass affected the gums of both jaws, and was of a dense fibroid structure. It first began to attract attention at the age of nine months, but there can be no doubt, from its history, that it had existed from birth.

The gum of the upper jaw formed a tumor of a pale color, inelastic, perfectly insensible, and of firm consistence, presenting very much the appearance of the snout of a hog. It stood off very obliquely, and received but a very partial covering from the corresponding lip. It was rough on the surface, and was about an inch and a quarter in its antero-posterior diameter, its length having been about one inch and a half. At its free margin, which was quite irregular, was seen the tip of the left central incisor. Extending back from this tumor on each side the whole length of the jaw, was the enlarged gum, forming a thick, broad ridge, completely imbedding the teeth. At several points, particularly behind, the morbid growth was more than nine lines in width; in front and at the middle it was less. It was of a more florid color than the main tumor, but of about the same degree of consistence. Opposite the site of the bicuspid teeth, on each side, it exhibited a remarkably granulated appearance, the excrescences having a pediculated form, and being folded upon each other. Projecting towards the roof of the mouth, it greatly encroached upon this cavity, lessening its capacity, and thus interfering with its functions, as well as with speech and respiration.

---

[1] Description of the Gangrenous Ulcer of the Mouths of Children. By B. H. Coates, M. D., one of the physicians of the Philadelphia Children's Asylum. North American Medical and Surgical Journal, vol. ii., 1826.

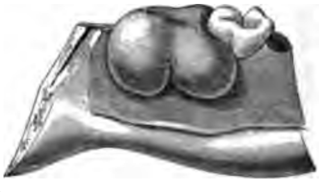
The lower gum was in the same condition as the upper, equally hard and insensible, but less developed. It was of a bluish florid complexion, and larger in front and behind than at the intermediate points; its free surface was uneven, and so prominent as to hide all the teeth, except the central incisors, the point of the right cuspid, and the cusps of each deciduous and first permanent molars.

Enormous enlargement of the gums is sometimes witnessed in *scurvy*. They assume, often at an early stage of the disease, a red, livid, or purple appearance, become soft and spongy, generally bleeding on the slightest touch, and form two large ridges in which the teeth, loose and discolored, are, at times, almost completely buried. The enlargement is of an inflammatory nature, and probably depends upon a depraved state of the system, produced by impoverished diet.

Another disease deserving of mention here is *alveolar abscess*, or, as it is familiarly termed, gum-boil. Although this may be produced by a great variety of causes, yet the most common by far is the irritation of toothache, or the existence of a dead fang. This, acting as an extraneous body, excites inflammation in the periosteum of the alveolar cavity, followed by an effusion of plastic lymph, which becomes condensed into a sac, in the centre of which pus is formed. This sac, which is commonly of an ovoidal figure, closely embraces the root just above its extremity, which is, as it were, bathed in the purulent matter. The quantity of pus cannot of course be great, but the pressure which it exerts upon the investing parts always induces ulcerative absorption, by which it gradually makes an outlet through the gum, generally opposite the base of the dead fang.

One of the most formidable diseases of the gum, though fortunately not a very common one, is *epulis*, as it is termed, which generally presents itself in the form of a small wart-like excrescence, of a reddish color, and of a hard, gristly consistence. Its growth is seldom rapid, nor is it attended, at first, with any decided pain or inconvenience. After having remained for some time, it loses its solid feel, becomes soft and spongy, bleeds upon the slightest touch, and throws out an abundance of irregular cauliflower-like processes. Ulceration now commences, the morbid

Fig. 175.



Epulis in its earlier stages. From a specimen in my cabinet.

mass rapidly augments in volume, and there is a constant discharge of fetid, purulent matter. At this stage of the disease, the gum has a remarkably red and spongy aspect, the teeth drop from their sockets, and the lymphatic ganglions in the neighborhood are more or less contaminated; the pain is also very great, and the system labors under hectic. If the tumor be excised, it almost invariably returns, and requires a fresh operation, especially if a part be left behind. Epulis never occurs in those situations of the gum from which the teeth are perfectly removed; nor is it usual to see it without some disease of these organs, or of the sockets in which they are contained. Its most frequent, though not constant, seat is on the transverse process of the gum, between the teeth.

There is a milder form of epulis, consisting of a mere local hypertrophy, varying in volume between that of a pea and an egg. It is invested by a prolongation of the mucous membrane of the gum, and is intersected by fibrous filaments, which add much to its density and cohesive power. Vessels enter it at every point, and, in some cases, the tumor appears to be almost entirely made up of them.

VI. *Tonsils.*—The most common diseases of the tonsils are inflammation, suppuration, hypertrophy, and ulceration. Gangrene and the heterologous formations are very infrequent.

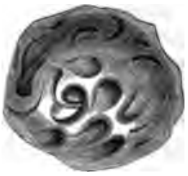
*Tonsillitis* is a very common complaint in cold and variable climates, particularly in spring and autumn. It is occasionally epidemic, but never contagious, and often coexists with laryngitis, bronchitis, pneumonia, scarlatina, small-pox, and measles. It is, perhaps, equally frequent in both sexes, and generally affects both glands simultaneously, though seldom in an equal degree. The disease may occur at any period of life, but is most common in children and young adults. It is announced by a sensation of dryness, heat, and pain in the fauces, with difficult deglutition, and a high grade of febrile excitement. On inspecting the throat, the organ is found to be considerably swollen, and of a uniform crimson color. The natural secretion is, at first, partially suspended, but in a short time it augments in quantity, becomes remarkably tenacious, and presents a pale, cream-like aspect. When the inflammation is at its height, the surface of the organ is of a dark purple color, traversed by an immense number of vessels, and incrusted with patches of lymph, of a dirty grayish tint, tough, firmly adherent, and resembling superficial sloughs. The swelling is often so great that the glands touch each other at the median line. The proper substance of the tonsil is unnaturally soft, infiltrated with serosity, vascular, and of a deep fleshy red, with various shades of brown, violet, and purple. Occasionally small ecchymoses are observed beneath the mucous membrane, and, in violent cases, pure blood is effused in the parenchymatous texture. When there is much swelling, the mouths of the mucous follicles are either entirely obliterated by compression, or closed with thick, viscid mucus, or plugs of fibrin.

This disease is seldom wholly confined to the tonsils. In the generality of cases, it extends to the root of the tongue, the uvula, the curtain of the palate, and even to the Eustachian tube, giving rise to pain in the ear and to partial deafness. Occasionally it affects the larynx.

Tonsillitis often terminates in *abscess*. The period which intervenes between the commencement of the inflammation and this occurrence varies from six to eight days. The pus, which is generally excessively fetid, is of a thick, cream-like consistence, of a pale yellowish color, and intermixed with flakes of lymph. It is commonly deep seated, and almost always breaks into the mouth. In rare instances it has been known to work its way out under the angle of the jaw. In a case observed by Londe, the matter passed down the neck along the great vessels, and finally penetrated the chest, where it speedily induced fatal inflammation. Both tonsils occasionally suppurate simultaneously.

One of the most frequent affections of the tonsils is *hypertrophy*, induced by frequent attacks of chronic inflammation. The organ in this disease is enlarged in all directions, and is of a firm, almost fibrous, consistence; its surface is of a pale reddish, or cineritious hue, and its mucous follicles are often five or six times the natural size. (Fig. 176.) Sometimes the orifices of these follicles are closed with inspissated mucus, earthy concretions, fibrinous plugs, or tubercular matter. Instead of being tough and indurated, the organ may be remarkably friable, distinctly lobulated, and of a red, brownish, or violet complexion. This state is most common in scrofulous children under ten years of age.

Fig. 176.



Hypertrophy of the Tonsil. From a specimen in my cabinet.

Hypertrophy of both tonsils is apt to be attended with defective speech, hearing, and breathing, together with a singularly altered condition of the chest, which is rounded and arched behind, contracted in front, and flattened at the sides. The neck is bent forwards, and the patient labors under an habitual stoop. During sleep the breathing is excessively embarrassed, the head is thrown back so as to bring the mouth on a line with the larynx, and the surface is bathed with perspiration; effects evidently produced by the inordinate action of the respiratory muscles to overcome the mechanical obstacle which the enlarged glands offer to the introduction of the air into the lungs. The disease, which often continues for years, occurs mainly in persons of a scrofulous predisposition, and is seldom, if ever, witnessed in advanced life.

*Gangrene*, as a termination of this disease, is extremely rare. The event is announced by the fetidness of the breath, the livid state of the parts, and the dark, sanious discharge from the throat. On examining the tonsils after death, they are found to be pulpy, disorganized, and of a deep gray, ash, or mahogany color. Gangrene and sloughing of these parts are most common in some of the exanthematous fevers, especially in scarlatina.

*Ulcers* of the tonsils are most frequent in syphilitic subjects, or in persons who are laboring under syphilitic and mercurial disease. In either case, they have generally an excavated appearance with elevated edges, and a foul, dirty-looking bottom. The surface around is inflamed and of a copper color. Occasionally, the sores present themselves in the form of chaps, fissures, or narrow lines. When the morbid action is severe, and the constitution very irritable, the ulcers are apt to assume a phagedenic character, spreading in different directions, and causing great destruction, not only in the tonsils, but in the adjacent parts.

The tonsils, in common with other parts of the body, are liable to some, if not all, of the heterologous formations. Of these the most common is the *tubercular.* The matter is of a pale yellowish color, semi concrete, and arranged in small, isolated particles, from the volume of a pin's head to that of a hemp-seed or a pea. It may undergo more or less complete softening, and is often transformed into chalky concretions. The disease is generally associated with hypertrophy of the gland and tubercular deposits in other structures, particularly the lungs and lymphatic ganglions. It is most common in young scrofulous subjects.

*Encephaloid* of the tonsils has been occasionally observed. The disease, however, is exceedingly rare, and usually coexists with similar deposits in other organs. It may occur as an infiltration, but most commonly presents itself in disseminated masses, or as a solitary tumor, of variable shape and size. The two forms of carcinoma, termed scirrhus and melanosis, probably never attack this organ. An instance has been observed in which a hypertrophied tonsil contained a large cyst, filled with serous fluid.

The tonsil is sometimes the seat of *chalky, calcareous,* or *earthy concretions.* They may be situated in the parenchymatous texture of the gland, or, as is more commonly the case, in its follicles or excretory ducts. Their composition is phosphate and carbonate of lime, agglutinated by a small quantity of animal matter. They have usually a white, grayish, or light brownish color, a spherical figure, and a finely tuberculated surface. Their volume seldom exceeds that of a mustard seed. In number they vary from one to half a dozen or upwards. They have occasionally a lamellated arrangement, with a distinct central nucleus.

Concretions of a purely animal character occasionally block up and distend the lacunæ of the tonsils. They are of a whitish, grayish, or yellowish tint, unctuous or greasy to the touch, extremely fetid, and from the volume of a hemp-seed to that of a pea. Their composition appears to be fibrin in union with mucus.

VII. *Palate and Uvula.*—The lesions of the soft palate do not differ, on the whole, from those of the tonsils, and any labored description of them would therefore be superfluous.

*Polypes* sometimes grow from this part. I have repeatedly seen little tumors of this description hanging down from the soft palate into the fauces, their attachment being usually effected by a very slender pedicle to the side of the uvula, or to the mucous membrane over the palato-pharyngeal muscle. They are always of a florid color, and of a soft spongy consistence.

*Split-palate* is a congenital defect, analogous to hare-lip, with which it often coexists. It occasionally affects only the soft parts, in which case there is no lack of substance, but the opposite halves recede from each other at an angle of about thirty degrees. When the maxillary and palate bones are involved, the fissure always corresponds with the mesial plane, and is sometimes so great as to throw the buccal and nasal cavities into one large sinus. In cases of this kind, there is, of course, an entire absence of the vomer, if not also of the perpendicular lamella of the ethmoid bone. Even the cribriform plate of this bone may be deficient, the olfactory nerve wanting, and the cerebrum considerably malformed.

The *uvula*, like the soft palate, originally consists of two lateral pieces, which, in some instances, remain ununited at the raphé, thus forming a congenital defect parallel to hare-lip and split-palate. This malformation, however, rarely exists singly.

The most common lesion of the uvula is *hypertrophy*, in which the organ becomes abnormally long and bulky. Its consistence is also sensibly increased; its vessels are enlarged; and its color is a light grayish, instead of a florid red. The consequences of such changes are well known. The part becomes troublesome in deglutition and talking, and causes a disagreeable tickling at the root of the tongue, attended with an annoying cough and frequent retching.

Gangrene rarely affects the uvula. In anginose inflammation, it is often remarkably œdematous or incrusted with lymph, which is detached either piecemeal, or in the form of a nipple-shield, a thimble, or the finger of a glove. In syphilitic sore throat, the uvula is sometimes entirely destroyed; at other times it is perforated at its base.

VIII. *Pharynx.*—The lesions of the pharynx resemble, for the most part, those of the tongue and tonsils; but there are several which are peculiar, and which therefore demand separate consideration.

Acute *pharyngitis* is ordinarily characterized by redness and tumefaction of the affected part, with a secretion of thick, grayish mucus. In the more severe forms, however, there is, additionally, an effusion of lymph, which appears either in small patches, or, as is more frequently the case, as a continuous layer over the whole surface of the reservoir. Hence, on the one hand, the exudation generally extends upwards over the tonsils and the soft palate; and, on the other, downwards into the œsophagus, the larynx, the trachea, and even the bronchial tubes. Much diversity obtains in regard to the color and consistence of these adventitious membranes. When first formed, they are usually of a light yellowish tint, and so soft that they can be easily wiped off with the finger; in a short time, however, they become grayish, and acquire considerable tenacity, forming pretty hard incrustations. In very intense cases, blood is apt to be exhaled, which, mixing with the exudation, imparts to it a dark brownish hue. The mucous membrane itself is of a deep livid complexion; the subjacent cellular tissue is infiltrated with serosity; and all the vessels are engorged to such a degree that it is impossible either to inject or unload them by pressure and ablution.

This disease, known under the name of *diphtheritic* inflammation, is by no means an uncommon attendant on smallpox and scarlet fever, but also occurs very frequently as an idiopathic affection in children, especially in such as are naturally weak, or who have become so by indisposition or impoverished diet. The symptoms are generally severe; and, when the exudation extends down the air-passages, death is often induced by suffocation, in the same manner as in pseudo-membranous croup.

*Abscess* of the pharynx is of rare occurrence. The matter is seated in the cellular tissue behind the mucous membrane, and may show itself as the result of acute inflammation, or of tubercular irritation. Of the latter form of the disease I have observed several instances in subjects of a strumous constitution. In one, a young man between twenty-five and thirty, the abscess was situated on the left side of the middle line, and contained nearly an ounce of thin, greenish pus, intermixed with caseous substance. The tumor, which fluctuated under the finger, produced so little inconvenience that the patient, who was far advanced in phthisis, had not even suspected its existence. The mucous membrane of the pharynx, both over and around the abscess, exhibited no unusual appearances. When the abscess is acute, the matter, although usually small in quantity, may, by pressing on the glottis, produce great distress in the throat, with dysphagia, aphonia, and dyspnœa, followed in some instances by death.

The pharynx is occasionally the seat of tubercle, scirrhus, and encephaloid. When the latter of these growths attain a considerable magnitude, as they sometimes do, they are apt to prove troublesome by their mechanical obstruction. Polypous growths are sometimes met with in this situation, of a florid color, soft consistence, globular or pear-like in shape, and attached by a long, slender footstalk. Such growths, although they rarely attain much volume, may cause serious inconvenience by their mechanical obstruction to respiration and deglutition.

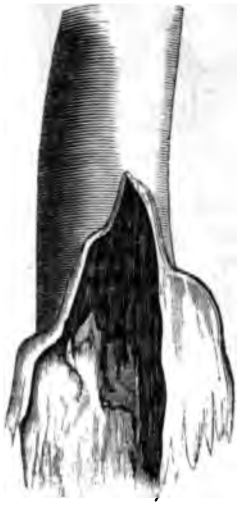
The pharynx is liable to become *sacculated*, a blind pouch being formed at its junction with the œsophagus. This is most apt to happen at the posterior part of the tube, and the disorder is chiefly inconvenient, as having a tendency to entrap particles of food in their descent from the mouth to the stomach. A bag capable of holding several ounces may thus be formed.

IX. *Œsophagus.*—The diseases of the œsophagus, though much less numerous than those of the mouth and fauces, are not less dangerous in their tendency, or less interesting to the student of morbid anatomy. Amongst the most important of these lesions are diphtheritic inflammation, ulceration, softening, stricture, scirrhus, and laceration.

Simple *œsophagitis* is marked by the usual symptoms of redness, pain, and tumefaction, with dryness of the part, and difficulty of deglutition. In violent cases, as, for example, when the inflammation is caused by corrosive poisons, there is an abrasion of the cuticle, and an effusion of lymph. The diphtheritic form of the disease has been witnessed in hydrophobia; and there is reason to believe that it is sometimes caused by a suppression of the cutaneous perspiration. In the winter of 1838, I saw the stomach and œsophagus of a boy, thirteen years old, who suddenly expired in convulsions after an illness of three days. The patient complained of severe pain in the fauces, and had great difficulty of swallowing, every attempt of this kind being followed by spasm of the throat, especially when the substance was of a fluid nature. On inspecting the œsophagus, I found it lined throughout by a thin layer of lymph, closely adherent to the mucous coat, which was itself highly injected, and of a bright red color. The stomach was perfectly sound, the inflammatory appearances terminating abruptly at the cardiac orifice. Dr. Mount, who attended the lad, and was present at the examination, informed me that he had traced the adventitious membrane also around the mouth of the larynx and over the whole of the fauces during life. The case was supposed to have been one of hydrophobia.

These membranes rarely become organized. When the inflammation subsides, they gradually lose their moisture, together with their adhesive properties, and are either vomited up in small tubular fragments, swallowed and digested, or swallowed and passed by stool. A case has been reported where an exudation of this kind was found in the œsophagus of a new-born infant. It lined the tube for about a third of its extent, and seemed to be closely identified with its proper substance. Fig. 177 represents a tubular piece of lymph cast off by the œsophagus during a fit of vomiting. The patient, a man about thirty years of age, was affected with mania-a-potu, of which he finally died. The drawing is from a preparation in my cabinet.

Fig. 177.



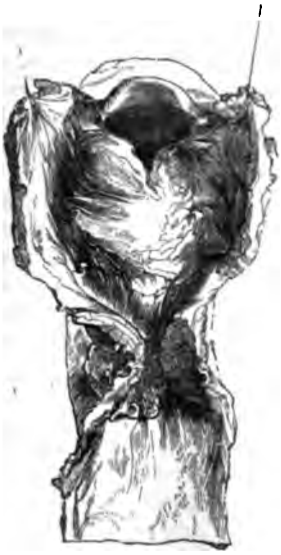
False membrane of the œsophagus. From a specimen in my cabinet.

*Ulcers* of the œsophagus most frequently occur at the upper part of the tube, near its junction with the pharynx. They may be of various forms and dimensions; and, in the generality of cases, their edges are smooth and rather thin. When, however, they are associated with scirrhus, the surrounding structure is very much elevated, and often consists of a dense fleshy substance, interspersed with gristly matter. These ulcers sometimes lead to perforation.

*Abscesses* may form between the coats of the œsophagus, and, by compressing the trachea, affect the breathing. When very large, they encroach upon the caliber of the gullet, and impede deglutition. Dysphagia may also result from enlargement of the thyroid gland, projection of the dorsal vertebræ, and aneurism of the aorta. In a man, forty-nine years of age, whom I examined in 1827, the œsophagus and aorta communicated by a large aperture, through which more than half a gallon of blood had suddenly passed into the stomach, and thus caused death.

*Softening* of the œsophagus, of the same nature as that of the stomach, is sometimes observed. One of the most common effects of the lesion is perforation of the walls of the tube, and an escape of fluid into the thorax. The opening usually occurs near the cardiac extremity of the œsophagus, in connection with an inflamed, softened, or perforated state of the stomach, though occasionally there is no appreciable alteration whatever in any of the surrounding textures. No age, not even early infancy, is exempt from this lesion.

Fig. 178.

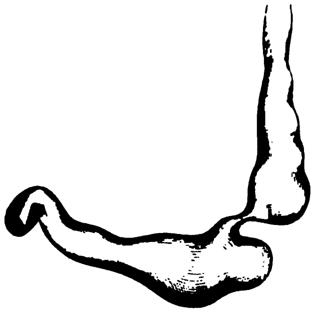


Stricture of the œsophagus.

*Stricture* of the œsophagus almost always results from inflammatory thickening of the submucous texture, with more or less alteration of the proper lining. A sort of ring, of variable depth and firmness, is thus formed (Fig. 178), which encroaches upon the channel, and produces great difficulty in swallowing, aggravated frequently by spasmodic exacerbations. In a case which I examined some years ago, the tube was so much contracted that it would scarcely admit a common-sized quill. The stricture, about six lines deep, and of gristly firmness, was seated within three inches of the cardiac extremity of the stomach, and caused death by inanition. The ordinary place of stricture, however, is not so low down, but near the junction of the tube with the pharynx. If neglected, the contraction progressively increases, and the œsophagus, ulcerating, may finally open into the posterior mediastinal cavity, the trachea, or the lungs. The part above the stricture is sometimes sacculated, and so large as to be capable of holding from a pint to half a gallon of fluid.

*Dilatation* of the œsophagus, consequent upon stricture, is well shown in the adjoining sketch (Fig. 179), taken from a gentleman, about forty years of age, who died in 1849, of scirrhus of the cardiac extremity of the stomach. Some time prior to this event, he consulted the late Dr. Drake and myself on account of difficult deglutition, of long standing, attended with a constant sense of constriction in the chest, frequent paroxysms of choking, occasional cough, and progressive emaciation. In swallowing food and drink, he was conscious of a feeling of obstruction in the œsophagus, but the passage of a probang failed to throw any light upon its site and extent. Upon dissection, the tube was found to be enormously dilated in its entire length, especially inferiorly, where it was three inches in diameter.

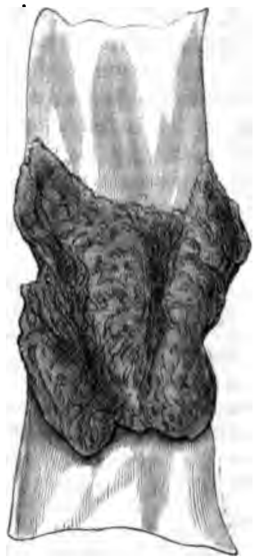
Fig. 179.



Dilatation of the œsophagus, from organic disease of the cardiac extremity of the stomach. From a drawing in my possession.

It contained upwards of a pint of fluid, swallowed two hours before death, and was as elastic as a piece of India-rubber. A tight stricture, half an inch long by three-eighths of an inch in diameter, of a whitish, gristly nature, and hardly large enough to admit the handle of a scalpel, existed at the cardiac extremity of the stomach, which was itself much reduced in size, although sound in other respects. The immediate cause of death was a large abscess, extending along the right side of the spine, from the second rib to the diaphragm, containing not less than a quart of matter, the lung being firmly attached to its outer surface. The left lung was healthy, but some of the principal bronchial tubes were filled with pus. The aorta was much enlarged, while the heart was smaller than natural, although otherwise sound. No disease was observed in any of the other organs.

Fig. 180.



Ulcerated scirrhus of the œsophagus. From a preparation in my collection.

Occasionally the stricture is of a spasmodic nature, being produced by the contraction of the circular fibres of the œsophagus. In this case the difficulty is generally temporary, and may be easily overcome by a bougie.

*Carcinoma* (Fig. 180) of the œsophagus is uncommon, and is generally of the scirrhous character, its ordinary site being the inferior half of the tube, and its favorite period of life old age. Taking its rise usually, if not always, in the submucous cellular tissue, it extends in different directions, forming gradually a large mass, which seriously encroaches upon the caliber of the tube, and ultimately destroys life either by irritation, hemorrhage, or inanition. I have never met with melanosis, colloid, and encephaloid in the œsophagus, but a few cases of the latter have been reported by authors. Tubercle rarely, if ever, occurs here.

*Laceration* of the œsophagus generally takes place during the act of vomiting, without any antecedent structural lesion. The rent is commonly transverse or somewhat oblique, and varies in extent from a few lines to half an inch or more. The inferior portion of the tube gives way more frequently than the upper or middle; sometimes the rupture is situated immediately above the cardiac extremity of the stomach. The accident is characterized by violent pain, with symptoms of sinking, and usually proves fatal, in from thirty-six to forty-eight hours.

The œsophagus, finally, is liable to various *malformations*, which, although not of frequent occurrence, constitute an interesting subject of study. A bare enumeration of them, however, is all that we can attempt here. The following arrangement will be found to embrace the most important deviations which have hitherto been observed: 1, the œsophagus terminates in a cul-de-sac, either within a few inches below the pharynx, or at a short distance above the cardiac extremity of the stomach; 2, it is obliterated, contracted, or converted into a solid cord; 3, it is unnaturally dilated, or even double; 4, it is totally deficient, the pharynx ending in a blind pouch, and the stomach having no cardiac orifice; 5, it communicates with the trachea. Of the latter variety, an interesting and instructive case was observed by Dr. Martin, of Marseilles, in an infant that died thirty-six hours after birth. On dissection, there was found to be an entire absence of the pharyngeal extremity of the œsophagus; but an aperture existed in the trachea, just above its bifurcation, through which a probe could be passed into a thin, membranous, elastic tube, of the diameter of a small quill, that led to the stomach, and thus established a communication between the cavity of that organ and the air-passages.

---

# CHAPTER XX.

## STOMACH AND BOWELS.[*]

I. **Consistence and Color** *of the Gastro-Enteric Mucous Membrane;* **how modified by Age, Digestion, and other circumstances.—II.** *Inflammation.*—**Anatomical Characters of the Acute Form of the Disease.—Increased Vascularity.—Dryness.—Thickening.—Softening.—Deposition of Lymph.—Formation of Vesicles.—Effusion of Blood and Serum.—May pass into Gangrene or become Chronic.—III.** *Softening;* **of two kinds, from Inflammation, and the Action of the Gastric Juice.—IV.** *Diseases of the Stomach.*—**Ulceration.—Hypertrophy and Atrophy.—Formation of Pouches.—Cartilaginous Degeneration.—Carcinoma.—Laceration.—V.** *Lesions of the Duodenum.*—**VI.** *Affections of the Small Bowels,* **properly so called. Ulceration of the isolated Crypts and of the Glands of Peyer.—Typhoid Fever.—Infantile Cholera.—Tubercular Deposits.—Melanosis.—Intussusception.—Hernia.—Abnormal Pouches.—Repair of Wounds.—Atrophy and Hypertrophy.—Earthy Concretions.—VII.** *Lesions of the Large Bowel.*—**Ulcers.—Wart-like Vegetations.—Singular Contraction of the Colon.—VIII.** *Vermiform Appendage.*—**IX.** *Recto-Anal Region.*—**Carcinoma.—Fissure of the Anus.—Enlargement of Pouches.—Organic Stricture of the Rectum.—Polypes.—Hemorrhoids.—Fistule.—Prolapse of the Bowel.—Congenital Vices.—X.** *Intestinal Worms.*—**Lumbricoides.—Oxyuris.—Tricocephalus.—Tænia Solium.—Tænia Lata.**

## SECTION I.

### CONSISTENCE AND COLOR OF THE GASTRO-ENTERIC MUCOUS MEMBRANE.

THE natural consistence of the mucous membrane of the alimentary tube is liable to considerable variation; but it may be stated, as a general rule, that it is in direct proportion to its thickness. Thus, it is much more firm in the pyloric half of the stomach than in the cardiac; and it is in that situation, also, that it has the greatest degree of thickness. In the duodenum the rule does not hold good; for, although the mucous membrane is thicker and more opaque here than in any other portion of the digestive canal, yet, owing to the presence of the glands of Brunner, which are remarkably large and numerous, as well, perhaps, as to some peculiar mode of organization, the structure in question is exceedingly brittle, and can seldom be raised except in very small fragments. Lower down, the consistence of the membrane progressively increases, so that in the inferior third of the jejunum and in the ileum it may be torn from its connection, in pieces varying from three lines to half an inch in length. In the large bowel, the cohesive property again diminishes, the membrane being detachable only in small, shreddy patches. It need hardly be remarked that the normal consistence of the mucous coat of the alimentary tube is much less in the infant than in the adult. At what period of life it attains its maximum development, in this respect, is a point concerning which we have no positive intelligence.

The *color* of the gastro-enteric mucous membrane varies at different periods of life. In the fœtus, and the child soon after birth, it is of a light rose, interspersed with small milky spots; in the adult, it is more of a whitish appearance, but still preserves some degree of its reddish tint; towards middle life it assumes a dull grayish aspect, which continues, gradually increasing, until finally, in decrepitude, it becomes quite cineritious.

During digestion, the mucous membrane of the stomach is of a light red color, approaching almost to vermilion, especially in young subjects from the second to the tenth year. The duodenum, and occasionally even the jejunum, participate in this increased vascularity, which always diminishes in proportion as the process of chymification advances to completion. Except from this circumstance, this portion of the small intestine never presents that red dye which has been so often ascribed to it. Although this redness uniformly exists, to a greater or less extent, during digestion, yet there is no doubt it is essentially modified by the quality, as well, perhaps, as by the quantity of the food.[1] It has been ascertained that if two dogs, of the same size and age, be fed, the one upon milk, and the other upon fatty broth, highly seasoned with salt and pepper, and both be killed an hour after, the mucous membrane of the stomach of the latter will be of a much deeper red than that of the former, at the same time that the augmented vascularity will extend much further down the small bowel. From this circumstance, which exerts so great an influence upon the rest of the alimentary tube, the ileum and colon experience little or no variation in their appearance.

The redness which supervenes during digestion is remarkably lessened, but never completely effaced, by exsanguification. Of this any one may convince himself by opening an animal during the process of chymification, and cutting the aorta and vena cava, the latter especially, which, as is well known, has always the effect, when divided, of giving the surface of the alimentary tube a pale, blanched appearance.

---

[1] The late Dr. Beaumont, of the United States Army, who had the rare opportunity of inspecting the gastric mucous membrane through a fistulous channel in the abdomen, states that the color of the inner surface of St. Martin's stomach, when empty, was usually of a pale pink; but that, on the application of food, the action of the vessels became augmented, and the color of the villous tunic considerably heightened.

The color of the gastro-enteric mucous membrane is considerably influenced by the kind of death. In general, the rosy tint very much diminishes, so that we commonly find in young children that have died of protracted diseases, an unnatural pallor, amounting sometimes almost to a milky whiteness. In persons who are drowned, hung, or otherwise asphyxiated, the inner surface of the stomach and bowels is often of a crimson color, occurring either continuously or in large patches. Dr. Yelloly, of England, who devoted much attention to this subject, states that he has observed this condition of the mucous coat of the stomach successively in five executed criminals; and Professor Monro, of Edinburgh, informs us that he has repeatedly, under similar circumstances, seen the gastric lining of a tile red. In a mulatto woman, who was executed in the winter of 1835, and whose body I had an opportunity of inspecting soon after the event, the whole mucous surface of the alimentary tube was so deeply injected, as to present a deep lake color, especially distinct in the stomach, and in the inter-valvular spaces of the jejunum. Similar phenomena I have had occasion to witness in a female who was destroyed by manual strangulation, in a man who hung himself, and in dogs and rabbits asphyxiated for experimental purposes.

If an animal be kept without food for three or four days, and then killed, the stomach and bowels will be found to be of a red rosy color: the mesenteric vessels considerably distended with blood; the isolated follicles enlarged; and the villous membrane unnaturally rough, softened, and easily detached. Not unfrequently, indeed, the color of these organs, under such circumstances, will be of a cherry red, bright lake, or vermilion. If the abstinence, however, be prolonged for a considerable period, then the mucous membrane, participating in the general anæmia of the system, will be apt to be pallid, though cases occasionally occur, even in the human subject, in which the reverse of this obtains.

Various substances, when taken into the stomach, have the property of imparting to the mucous membrane a deep red color, which may be mistaken for the effect of poison. Of this nature are the infusions of logwood and red poppy, together with black currants, the tincture of cardamom, and the compound spirits of lavender. A knowledge of these facts is of much importance in a medico-legal point of view: as a person, after having swallowed some one or other of these substances, might suddenly expire, and from the mucous membrane of the stomach and bowels being found of a red tinge, the suspicion might arise that he had been poisoned.

I have stated, elsewhere, that nitrate of silver, when taken internally for a long time, had the effect of staining the external integument with a gray slate color. Similar results follow in regard to the mucous membrane of the alimentary canal. In a case examined by Dr. Rayer, of Paris, where the substance in question had been taken for thirteen months, for the cure of epilepsy, consequent on disease of the brain, the internal surface of the whole alimentary tube, together with the interior of the mouth and sides of the tongue, was of a gray slate color. In the stomach the tint was extremely deep, and uniformly diffused; in the bowels, it was somewhat more faint, but still quite appreciable, and was interrupted here and there by minute vascular specks. The skin exhibited a precisely similar hue.

In traumatic fever, caused by wounds of the head or extremities, the mucous membrane often assumes a bright reddish color, which, although it does not seem to be always associated with derangement of the digestive passages, cannot be easily removed by exsanguification. This fact, first experimentally ascertained by Gendrin, has been fully corroborated by the later researches of Mr. Swan,[1] of London. The numerous observations of this distinguished anatomist have proved, in the clearest manner, that the insertion of any of the mineral poisons, or even mercurial frictions, on the back of a dog, after shaving off the hair, communicates a red color to the villous coat of the whole alimentary tube.

## SECTION II.

### INFLAMMATION OF THE GASTRO-ENTERIC MUCOUS MEMBRANE.

With these preliminary observations concerning the healthy consistence and color of the gastro-enteric mucous membrane, designed to enable the young pathologist to avoid some of the many difficulties which beset this interesting field of inquiry, I proceed to take up the subject of its morbid anatomy. In entering upon this important topic, I do not deem it necessary to consider the lesions of each portion of the alimentary tube separately; to do so, would only lead me into useless repetitions, and compel me at every step to recount what has been already stated. Possessing the same structure, the stomach and bowels, small as well as large, are liable to the same diseases, whether acute or chronic, whether simply inflammatory or organic; and therefore, for all practical purposes, there can be no reason whatever why they should not be all described under one general head. Nevertheless, the method that I shall pursue will be somewhat different from that which the plan here stated might be presumed to indicate. Thus, after having discussed the subject of acute inflammation, together with its several terminations, with reference to the gastro-enteric mucous membrane generally, I shall speak of the more uncommon lesions as they affect each section of the alimentary passages in particular, pointing out whatever may be peculiar to them.

*Acute Inflammation.*—The anatomical signs of acute inflammation of the mucous membrane of the alimentary tube are, increased vascularity, loss of transparency, dryness, thickening, softening, deposition of lymph, and the formation of small vesicles, with alteration of the natural secretion and effusion of serum into the submucous cellular tissue.

---

[1] Monro, Morbid Anatomy of the Gullet, Stomach, &c., p. 313.

The first perceptible effect produced in the inflamed membrane is a change of *color*, caused by an augmented flow of blood to the affected part. The shades of tint are extremely numerous, but they may all be referred to modifications of red, brown, slate, and black. Of these, the first is by far the most common in acute inflammation, whilst the others are more usually the product of the chronic process, in which the coloring principle of the blood, perfectly incorporated, as it were, with the mucous texture, is variously altered in its properties, either from simple stagnation in the minute capillaries, or from contact with the acid and gaseous contents of the alimentary tube.

The inflammatory redness, although sometimes widely diffused, usually occurs in small irregular patches, separated by intervals of sound membrane. Varying in diameter from a few lines to several inches, they often project sensibly beyond the level of the circumjacent parts; and, in violent cases, are always of a bright red color, looking a good deal like so many pieces of scarlet velvet. Connected with this augmented vascularity, are commonly certain changes in the mucous and subjacent textures. In the early stage of the disease, there is perhaps merely a slight degree of opacity, with a rugose condition of the free surface of the membrane. Afterwards, however, as the inflammation progresses, the reddened patches lose their tenacity, and become covered with a thick, ropy mucus, elevated into small vesicles, chapped, or fissured, or studded with flakes of lymph. When all or several of these phenomena are present, no doubt can be entertained concerning the true nature of the disease, inasmuch as they are absolutely unequivocal.

But it is not always that the inflammatory redness is thus distinctly marked; and hence much difficulty is sometimes experienced in discriminating between it and that which is natural. Attention has been already directed to the well-ascertained fact that stimulating viands or drinks, received into the alimentary canal, produce an afflux of blood to the vessels of this cavity, by which the color of the mucous membrane is often so greatly heightened as to exhibit an appearance not unlike that observed in inflammation. This circumstance should be constantly borne in mind in making post-mortem examinations, otherwise the most serious mistakes must arise. How, then, are these two conditions to be distinguished from each other? for upon the correct decision of this point hinges the pathology of a large number of the diseases of the stomach and bowels. The answer is obvious—by comparison.

Thus, the inflammatory redness has rarely that uniform tint which is to be observed in the sound membrane; on the contrary, it is usually somewhat mottled, and, instead of terminating, as does the other, by insensible gradations, it almost always stops abruptly. The inflammatory discoloration occurs most frequently in small irregular spots, situated at different points of the circumference of the tube; whereas that resulting from simple congestion is commonly diffused over a large extent of surface, or is confined to the most depending parts. Another important feature is derived from the condition of the abdominal vessels. In inflammation, the distended capillaries seem as it were lost, being no longer traceable to any particular trunk; the reverse of which obtains when the redness is cadaveric, or caused by mechanical obstruction. The blood, too, in the former case, cannot be pushed about so easily from one place to another, from the great firmness with which it is impacted in the minute vessels, added, perhaps, to the preternatural viscidity of its fibrin, and to the abstraction of its aqueous principles. For the same reason, also, maceration produces its effects much more slowly than in the sound state, and minute injections seldom succeed so well, many of the vessels giving way in consequence of the difficulty of displacing their contents. These characters are not, of course, so well marked in incipient as in confirmed inflammation; nevertheless, they almost always exist to a greater or less extent.

Besides these diagnostic signs, the inflamed membrane is always opaque, from the engorgement of the capillary vessels, which, exhibiting the appearance of a fine network, are more distinct generally at the adherent than at the free surface of the mucous tunic. In the healthy state, on the contrary, or even when there is a slight degree of congestion, as occurs, for example, during chymification, the membrane is diaphanous, or at least very nearly so, and if a portion of it be detached, and held before the light, it will be found to be of a uniform rose tint.

The inflamed part offers considerable diversity in regard to the mode of its vascularity. Most commonly it is *arborescent*, the vessels being spread out like the branches of a tree. This species of injection, however, is never indicative of high inflammatory action, except when conjoined with softening of the mucous tissue, or deposition of lymph upon its surface. Hence it either soon disappears, without producing any appreciable symptoms, or it loses its dendritic arrangement, and becomes capilliform. A fine example of the present variety of vascularity is often to be noticed in the conjunctiva, when, from any transient cause, its minute vessels are made to convey red blood.

The *capilliform* injection always denotes, as just intimated, a much higher grade of irritation than the dendritic, to which it succeeds. In this variety, the capillary vessels are excessively crowded with blood and intersect each other in such a manner as to form a most intricate network, often particularly conspicuous round inflamed ulcers, the isolated follicles, and the glands of Peyer. It is frequently attended with softening of the subjacent cellular tissue, and can be completely removed by maceration in water for twenty-four hours.

Either alone, or conjoined with one or the other of the preceding varieties of vascularity, there is occasionally a singularly *speckled* appearance of the mucous membrane. When the dots are numerous, the affected surface looks very much like the section of an inflamed brain. It may also be imitated, with great nicety, by scattering fine grains of powdered vermilion upon a moist sheet of white paper. The appearance is much more frequent in the stomach than in the intestines, though at times it is found in nearly every membrane of the body. I have seen it, in the same individual, in the pleura and pericardium, the stomach and bowels, the spleen, mesentery, and omentum. The specks, sometimes very closely set together, vary in diameter from the smallest pin-head to that of a mustard-seed, and in color from a light rose to a deep cherry red. This species of vascularity, which does not denote an intense degree of irritation, proceeds from slight extravasation of blood, caused by the rupture of capillary vessels, in consequence of the impulse with which the fluid is forced into them at the onset of the inflammation. When it is conjoined, as very often happens, with the diffused redness, the dots generally occupy a considerable extent of surface, and occasionally run into each other so as to give the part a striated, streaked, or linear disposition.

In the highest degree of inflammatory action, as in that, for instance, resulting from the administration of some of the acrid poisons, *extravasations of blood*, of considerable magnitude, are not unfrequently met with. In such cases, the fluid seems to be originally poured out into the submucous cellular tissue, whence it extends into the proper villous membrane, forming patches of a dark livid hue. Dissection does not always reveal the true cause of these extravasations. Very frequently they can be traced directly to one or more ruptured vessels; in many cases, however, the capillaries of the part seem to be in a state of the most perfect integrity. How far, under these circumstances, we are authorized to ascribe the phenomenon in question to simple vascular exosmosis, it is not easy to determine. Judging from what we observe upon the free surface of the mucous and other membranes, where blood is often thrown out in considerable quantities, without any laceration of the vessels, it is not unreasonable to conclude that the ecchymoses here adverted to have occasionally a similar origin.

This bloodshot appearance, indicative of the most intense irritation, is often attended with thickening and softening of the villous tunic, together with a deposit of lymph upon its free surface, an effusion of serosity into the subjacent cellular tissue, and the secretion of an inspissated and tenacious mucus, or even of purulent matter.

The brown, slate, and black color, with their various intermediate shades, are usually ascribable to a process of chronic irritation, or to inflammation of long standing. They are seen, however, occasionally in cases of a high degree of acuity; in such, for instance, as result from corrosive poisons, violent diseases of the bowels, and the more severe forms of bilious fever of warm climates. The black color is often witnessed in protracted diarrhœa and dysentery, and is always characteristic of profound morbid action.

An interesting question arises here, can an inflammatory redness exist, and yet wholly disappear after death? Many pathologists think that it may; and, as the doctrine is of much importance, from the dangerous use which may be made of it in pathology, it demands a brief examination in this place. Those who have advocated the possibility of this occurrence, have adduced the fact that in many cases the traces of erysipelas will greatly diminish, if not entirely disappear, after death; and the same circumstances, it is well known, are often observed with respect to the redness of tonsillitis, and other inflammatory affections of the throat. This condition has been explained, by some, by assuming that the injection of the capillaries ceases as soon as the irritation causing it becomes extinct; whilst others have endeavored to account for it by supposing that, during the agonies of dissolution, the vitality of the affected part is so much diminished that it has no longer the power of attracting the blood in preternatural quantity. In regard to cutaneous diseases, this is unquestionably true; but, even here, cadaveric pallor of parts previously inflamed is far from being a general phenomenon, the redness oftentimes remaining long after death, especially in high grades of erysipelas, scarlet fever, measles, and old irritable ulcers.

But is this comparison strictly applicable to the mucous coat of the stomach and bowels? Closely as the skin and lining membrane of these hollow organs are related to each other by similarity of structure and function, and intimately as they are associated by sympathy, it is well known that their capillary injection is widely different under inflammatory irritation. Even in the highest grade of erysipelas, the blood can be easily enough forced out of its vessels, so as to give the part a pallid aspect, but nowhere can this be done, so far as we have opportunities of observing the fact, in confirmed inflammation of the mucous membrane. Compression of a highly irritated tonsil, or of a prolapsed rectum, never displaces the sanguineous fluid to so great an extent as in the skin, because it is impacted much more firmly into the minute vessels, the coats of which will often yield rather than allow their contents to be pushed along.

Moreover, the blood has not that natural tendency to recede from the mucous membrane during the last struggles of life that it has to recede from the skin: on the contrary, so far from this being the fact, we uniformly find the fluid to accumulate in the interior of the body; and, in many instances, if not indeed in most, there is reason to believe that this process goes on for some time after the heart has ceased to act, and the vital principle fled. The redness, therefore, of the inflamed membrane, so far from diminishing on the approach of death, would have a tendency rather to become heightened; and this no doubt occasionally happens, though, taking all the facts which have been adverted to into consideration, we must assume, as a general proposition, that the color remains precisely as it was during life.

Yet, although this subsidence does not take place in the generality of cases, it may, nevertheless, occur under certain circumstances. Thus, a high degree of irritation accompanied with deep redness, may exist in the lining membrane of the stomach; but, a severe dysentery supervening, a powerful revulsion will be the result, in consequence of which the original disease, with its attendant vascularity, will in a great measure subside; so that, on inspection, hardly any trace of gastritis shall be discernible. The same thing occasionally occurs in persons that are cut off, in a few hours, by violent attacks of cholera morbus. In some instances of this kind, where, from the intensity of the symptoms, no doubt could be entertained of the existence of the most intense inflammation, I have not been able to detect after death the slightest vascularity of the mucous membrane. Life, in such cases, seems to be destroyed by some lurking poison, exerting its baneful impression peculiarly upon the nervous system, without leaving any visible alteration in the organs whence it radiates its influence.

Enough, surely, has now been said to enable us to distinguish the different kinds of inflammatory redness, not only from each other, but also from that which appertains to the mucous membrane in the normal state. As the discussion of this subject has been carried to a considerable length, I shall content myself, in concluding this article, with a brief analysis of the other anatomical characters which are to be found, either alone or conjointly with this discoloration, in the acute variety of gastro-enteritis. These, it will be remembered, are opacity, thickening, softening, vesicular eruptions, and vitiated secretions.

One of the earliest effects, in addition to an alteration of color, of acute inflammation of the mucous membrane, is a diminution of its natural *transparency*. Even when there is but a slight degree of redness, the irritated spots lose, in a great degree, their diaphanous aspect; but, should the discoloration be deep and uniform, the opacity will be complete, owing to the extreme injection of the capillary vessels.

At the onset of the disease, the secretion of the membrane is somewhat augmented in quantity, but thinner and less viscid than in the normal state; the mucous follicles are also perceptibly engorged, and more prominent than usual, being encircled by a beautiful vascular wreath. When the inflammation is at its height, the secretion is almost suppressed, and the membrane, consequently, is dry, as happens in inflammation of the Schneiderian lining of the nose; but, as this period is always of short duration, the secretion is soon re-established, and often discharged in considerable abundance, being of a thick, ropy consistence, and of a grayish opaline color; occasionally, also, it is of a greenish tint, or dark and sanious. The orifices of the mucous follicles are enlarged and patulous; and if, under these circumstances, the membrane be carefully washed, it will be found to exhibit a granulated aspect, not unlike a pale fungous ulcer. Towards the decline of the disease, the secretion sometimes assumes a puriform character, and is often quite copious.

*Dryness* of the mucous membrane, as a result of inflammation, is much less usual than in some of the other textures of the body. The phenomenon is by no means uncommon, for instance, in the arachnoid tunic, where it is always indicative of intense irritation. The same circumstance is occasionally witnessed in the alimentary tube, and sometimes to a very considerable extent.

The surface of the inflamed membrane loses much of its natural softness; it becomes *rough*, from the turgid condition of its villosities and follicles, and, in very intense cases, it is not unusual to find it chapped, cracked, or fissured.

Increase of *thickness* is a pretty constant attendant on acute inflammation, the tumefaction appearing either contemporaneously with, or soon after, the redness. Effusion of sero-albuminous matter into the submucous cellular tissue, added to the injection of the capillary vessels, is the main cause of this anatomical character, which is never so well marked in the stomach and bowels as in the larynx, conjunctiva, or fauces. Occasionally, the thickening proceeds almost wholly from the mucous follicles, which may be so much enlarged as to give the surface of the affected membrane, as already stated, a rough, granular appearance.

At an early period of the attack, the density of the membrane is commonly somewhat augmented; but, in its progress to its height, as well as during its decline, it is always *preternaturally softened.* In this condition, which is deserving of much attention, both the mucous and submucous textures are frequently infiltrated with serum, muco-purulent matter, and even with blood; at the same time that they become so pulpy and disorganized as to admit of being scraped away with the finger-nail or the handle of the scalpel. Inflammatory softening, as will be shown hereafter, is much more common in some parts of the alimentary tube than in others, and, what is remarkable, is seldom attended with any decided redness, the part, which is opaque, and elevated, having every appearance as if the blood had ceased to penetrate it for some time prior to the extinction of life. Thus, then, whenever the irritation is of a high grade, the submucous cellular tissue uniformly participates in the disease.

A *vesicular eruption* is sometimes met with in this disease. It is indicative of a high degree of inflammatory action, and has hitherto been noticed chiefly in dysenteric affections and Asiatic cholera. The eruption consists in the development of minute spherical vesicles, very little elevated, and discharging, when punctured, a small quantity of clear limpid fluid. Their walls are perfectly transparent, and but few exceed the diameter of a grain of mustard. They often occur in thick clusters, hundreds being found upon a surface not larger than a square inch. No part of the alimentary tube is exempt from this eruption. It is observed, however, most frequently upon the valves of the jejunum, along the roots of which it is sometimes perfectly confluent, like the eruption of small-pox. In the ileum and colon, the vesicles are more scattered, and consequently much less numerous. They are generally associated with a chapped or excoriated condition of the mucous membrane, preternatural vascularity, deposition of lymph, and effusion of sero-albuminous, bloody, or purulent matter. How they are produced is still undetermined.

A *plastic exudation* is a frequent effect of inflammatory action. In the stomach and bowels, the deposition of this substance is much less frequent than in the supra-diaphragmatic portion of the alimentary canal. In children, the mouth, pharynx, and œsophagus are sometimes completely lined with it; but even in them it is far from being common, and seldom extends along the rest of the digestive tube. After puberty, this exudation is equally uncommon, both in the stomach and the intestines; but much more so in the former than in the latter. It is often met with in the large bowel of persons who die of dysentery and bilious fever. I have noticed it in this disease in a very great number of cases, in every part of the tube, but more particularly in the rectum, and ascending portion of the colon. The ileum also frequently suffers in this complaint, but I have never observed the exudation extend into the jejunum and duodenum.

The inflammation giving rise to this lymphy exudation occasionally assumes an epidemic type. Thus, in the spring of 1817, an abdominal phlegmasia prevailed extensively in Paris, in which nothing was more common than a discharge of pseudo-membranous matter both by the mouth and anus. In most of the patients that were admitted into the wards of the Hôtel-Dieu, the inflammation, especially during the decline of the epidemic, affected originally the stomach and small bowels, from which it gradually descended into the colon and rectum. In a large proportion of those who died of the disease, the pyloric half of the stomach was covered by an adventitious membrane, and the whole gastro-enteric lining was of an erythematous red color. The mucous corion was sensibly thickened as well as softened; and, in many places, there were small brownish-looking zones, likewise studded with fibrinous matter.

The membranous exudation usually takes place, in the first instance, in small whitish specks, separated by considerable intervals; these, gradually coalescing, form large patches; and these, again, continuous lamellæ, which often cover a very great extent of surface. A few years ago, I met with a specimen, in a young man who died of acute enteritis, after an illness of two weeks, in which nearly the whole of the lower half of the ileum was lined by a false membrane, in many places fully half a line in thickness: it adhered with considerable firmness to the surface beneath, which was extensively fissured, and of a dark, gangrenous color. The patient had suffered under all the symptoms of the most intense inflammation.

Is this substance, when thrown out upon the surface of the stomach or bowel, susceptible of becoming organized? Upon this subject the opinions of anatomists can scarcely be said, in any way, to accord. That the occurrence is possible, may be readily supposed from what occasionally happens in the larynx, the womb, and urinary bladder: that it is extremely infrequent must be equally plain, especially when we take into consideration the heterogeneous contents of the alimentary tube, and the tendency which they must have to thwart a process of such delicacy and refinement. Whether organized, however, or not, the adventitious membrane is always, sooner or later, detached, either in small semi-concrete masses, or, as sometimes happens, in long tubular pieces.

When acute inflammation runs so high as to give rise to bloody infiltrations beneath and within the substance of the mucous coat, or even to small ecchymoses, it occasionally terminates in *purulent effusions.* Under such circumstances, it is by no means rare to meet with considerable abscesses, either in the walls of the digestive passages, or in the contiguous portions of the mesentery, produced by an extension of the irritation, and opening most generally into the bowel. The mucous membrane, thus bathed and infiltrated with pus, is commonly of a reddish-gray color, very soft and yielding, being sometimes wholly disorganized, and converted into a dirty-looking, pultaceous substance.

Considerable quantities of pus are frequently discharged by the inflamed tunic, without any solution of continuity.

*Blood*, either pure or mixed with mucus and other matter, is often thrown out in violent attacks of this disease. This exhalation, for such in truth it generally is, is almost constantly present in dysentery and yellow fever, both of them high grades of inflammation, affecting, in the one case, the mucous coat of the colon, in the other, the mucous coat of the stomach. No doubt can be any longer entertained that the matter of black vomit is merely a transudation of blood, altered in its physical, and probably also in its chemical properties, by contact with the gastric acid. That it is a secretion from the vessels of the stomach, is an opinion now generally admitted. The quantity of this singular looking matter, once supposed to be nothing but vitiated bile, is sometimes exceedingly great; and yet, upon examination, no structural lesion whatever, excepting lymphy exudation, and perhaps softening of the mucous membrane, is to be found in the organ which is its seat.

The changes which the blood experiences, when brought in contact with the acid and gaseous contents of the stomach and bowels, are curious and important. When thus effused, the fluid is speedily deprived of its natural color, and converted into a soft, black substance, resembling thin pitch. Very much the same appearance is sometimes observed when the blood becomes stagnant in the villous and follicular structures of these organs, from the influence, probably, of the same cause. This discoloration will always be much greater, there is reason to suppose, in proportion to the quantity and vitiated condition of the gastric juice. Hence the reason, perhaps, why it generally has that peculiar coffee-ground appearance in yellow fever.

Thus, then, an exhalation of blood, either pure or variously altered by the gastric contents of the alimentary tube, may be another effect of acute inflammation of the mucous membrane. The attendant redness is generally patch-like or diffuse, and is not unfrequently accompanied by considerable-sized ecchymoses. Conjoined with these appearances may be softening, excoriations, and thickening of the villous tunic, with vesicular eruptions, and deposits of lymph. It may be added, in this connection, that, when ulceration and hemorrhage coexist, they should not necessarily be viewed in the light of cause and effect, since the latter, although thus associated, may be the result simply of exhalation.

Produced by the same process is the thin *rice-watery secretion*, which forms so prominent a feature of Asiatic cholera and violent diarrhœa. The essential character of this secretion is sero-albuminous, and the quantity poured out is often very great, several quarts being occasionally discharged in the course of a few hours. The fluid is, for the most part, inodorous, whitish, and of an aqueous consistence, with numerous flakes of lymph floating through it, which frequently impart to it a turbid, milky aspect; in diarrhœa, it is seldom so pure as in cholera, and it is also more apt to be offensive, from the union of feculent matter and vitiated mucus. It is partly coagulable by heat, alcohol, and acids.

The most prominent lesions connected with this sero-albuminous secretion are, softening of the villous membrane and hypertrophy of the follicles, with occasional depositions of lymph. What is remarkable, there is sometimes a complete absence of redness of the lining membrane, both of the stomach and bowels; a circumstance which may be satisfactorily accounted for, by supposing that the immense rice-watery discharges relieve the vascular engorgement prior to dissolution, so that, upon inspection, no discoloration whatever is perceptible.

Inflammation of the lining membrane of the alimentary tube frequently produces, even when it is entirely confined to the mucous corion, a well-marked injection in the other tunics. When the disease is very extensive and intense, the vascular injection may not only pervade the whole thickness of the stomach, small or large bowel, but even extend to the mesentery. Under such circumstances, the distended state of the neighboring vessels, and the purple discoloration and arborescent appearance of the peritoneal covering, either alone or in conjunction with flakes of adherent lymph, generally afford abundant evidence of the probable extent of the internal lesions. The mesenteric glands are sometimes swollen and inflamed, though seldom so much as in ulceration.

In active inflammation, the digestive tube is ordinarily dilated; this, however, continues only so long as the irritation is limited to the mucous lining; for as soon as it extends to the muscular tunic, the canal becomes invariably contracted.

One of the most singular circumstances connected with acute inflammation of the digestive passages, is a development of *gas*. This phenomenon has been variously explained by different pathologists; some supposing that it arises merely from a species of fermentation of the fluids which may be contained at the time in the stomach and bowels; others, that it is the result of a peculiar secretion, the nature of which is not understood. Without denying the truth of these explanations, both of which are, perhaps, to a certain extent, well founded, it may yet be doubted whether they are sufficient to account for the fact that this evolution of gas is present in some cases and absent in others. With a view of deciding this question, Gendrin irritated a portion of bowel in several dogs by caustic, alcohol, or boiling water, and then intercepted the inflamed part between two ligatures, having previously exhausted the air with a syringe. In two out of five of the animals thus treated, the gut was distended, in twelve hours after the operation, with an inodorous gas, the inflammation in both being rendered evident by the lively redness of the villous tunic; in the other dogs, although the discoloration was equally conspicuous, and produced by the very same substances, no air whatever was to be found. Is it probable that this fluid is disengaged from the bloodvessels of the affected part? This is not unlikely, when it is recollected that carbonic acid gas is evolved in great quantity, from the same source, in the lungs during respiration.

It is not unfrequently found that the inflammation, instead of invading the villous texture, properly so termed, begins in, and is confined exclusively to, the *isolated follicles*, scattered in such profusion over the alimentary tube. In the inceptive stage of the disease, the affected glands look like little boils, moderately projecting beyond the level of the surrounding surface. Varying in size from a small pinhead to a mustard-seed, they are generally of a spherical shape, soft, and of a reddish glossy aspect, each being marked by a minute, central aperture, indicating its natural orifice. At this period of the disease, the glands are already quite injected, and, if they be closely examined, it will be found that they are encircled by a beautiful wreath of vessels, so fine as to be almost undistinguishable by the naked eye. At a more remote stage, their color is of a light brown, their bulk is considerably augmented, and their surface, instead of being lubricated, as before, by an abundant mucus, is nearly dry, their secretory functions being in great degree suspended. This state, however, soon disappears, and is followed by a copious flow of fluid. When, as often happens, the villous membrane between the follicles participates in the disease, it gradually loses its natural characters, and exhibits some of those appearances which have been pointed out as denoting acute inflammation. The glands themselves are often very much softened, or so greatly disorganized as to give the surface of the digestive tube a singularly cribriform aspect.

Not unlike the preceding are the changes which the *glands of Peyer* undergo in acute inflammation. In the normal state, these bodies are seldom very distinct; when affected, however, by disease, they are rendered quite prominent, being considerably raised above the surrounding surface in the form of elliptical, ovoidal, or circular patches, from a few lines to several inches in diameter. In this state, they are of a florid color, from the injection of their capillaries, and their surface has an uneven, granular, or honey-comb-like appearance, from the projection of their follicles. The submucous texture is also considerably thickened, and the intervening membrane is more or less altered, according as it participates or not in the inflammation. Ulceration often follows this process.

Acute inflammation, whether affecting the villous or follicular textures, or both at the same time, may either terminate by resolution, pass into the chronic form, or proceed to disorganization. When it goes on favorably, the infiltrated fluids are gradually absorbed, the vascularity diminishes, the natural secretions are restored, the absorbing faculties become more and more vigorous, and, at length, the functions of the part are entirely re-established, the only alterations which remain being a thickened, and, occasionally, a slightly indurated state of the mucous and submucous textures. If the follicles have been mainly involved, the affected surface exhibits, after the lapse of some time, numerous dark dots, which have been compared, not unaptly, to those of a newly shaved beard.

With regard to acute inflammation, it may be observed, in conclusion, that its relative frequency is much greater in some parts of the alimentary tube than in others. The inferior half of the ileum, the stomach, and the commencement of the colon, are, without doubt, most commonly engaged, either alone or conjointly. This latter circumstance has given rise to the term *gastro-enteritis*, so much in vogue amongst the French pathologists, but which is not always applicable, inasmuch as the coincidence is by no means universal, or even general.

*Gangrene.*—Although acute inflammation occasionally terminates in gangrene, yet this effect is by no means so common as was at one time supposed by pathologists. By a reference to the works of the older anatomists, it appears that they were constantly in the habit of confounding high discoloration, whether proceeding from simple congestion, effusion of blood, or melanotic deposits, with mortification of the mucous texture. Since, however, a more accurate method of investigation has been introduced into science, it has been abundantly established that this lesion is of very rare occurrence. This remark applies, of course, solely to the idiopathic variety of inflammation, and not to that which is occasioned by strangulation, intussusception, external violence, or corroding poisons.

It is now well ascertained that some parts of the mucous membrane of the alimentary tube are much more liable to gangrene than others. The inferior half of the ileum is the section most commonly affected, and next in point of frequency stands the colon, particularly the ascending portion. It is an extraordinary fact that the stomach, jejunum, and duodenum are seldom implicated. Why these reservoirs should enjoy this remarkable immunity, both from this and some other affections, is inexplicable.

Large portions of the mucous membrane are sometimes deprived of their vitality. In general, however, the gangrene is much less extensive, occurring in small patches, of an irregular shape, and from one to several inches in diameter. The textures primarily affected are, the mucous and follicular, from which the disease may gradually spread to the other tunics, converting them into soft, dark-colored sloughs, incapable of resisting the slightest distension from fecal matter. Hence it not unfrequently happens, if the patient survives sufficiently long, that the intestinal tube gives way in one or more places, and discharges its contents into the abdominal cavity, as in perforation from ulcerative action.

The color of the sphacelated part is variable. Occasionally it is of a dark drab, dirty ash, or greenish tint; more commonly it is of a mahogany-brown, black, or livid, from the imbibition of the ichorous matter, which is often poured out in such abundance during the height of the inflammatory stage of the disorder. The mucous membrane which surrounds the slough is generally very much injected, and of a red mulberry color, indicative of excessive irritation.

With this change of color, the mucous membrane is generally so much softened that it can be removed by simply passing over it the handle of the scalpel. Usually the gangrenous part is remarkably offensive: it is frequently covered with flakes of lymph, and occasionally, though rarely, there are little phlyctenæ, not unlike those which are witnessed in mortification of the skin and cellular tissue. An emphysematous condition of the submucous cellular tissue is also sometimes found; but this, in the majority of cases, is to be regarded rather as a result of putrefaction than of inflammation.

When gangrene seizes upon the glands of Peyer, which, however, is not often the case, the sloughs are of a dark brownish color, soft and fetid, very much as in the preceding case; and, on being detached, deep excavations are formed, with loose, ragged edges. Although in the generality of cases these excavations do not extend beyond the submucous coat, yet occasionally they invade the whole thickness of the ileum, and thus give rise to perforation and fatal effusion. Sometimes, even when the gangrene stops short at the mucous and subjacent cellular textures, considerable bloodvessels, branches of the mesenteric arteries and veins, are laid open, and the patient perhaps perishes from hemorrhage. Appearances very similar to these are observed when the gangrene invades the isolated follicles, except that the surrounding parts are usually less red and injected.

*Chronic Inflammation.*—Chronic inflammation of the mucous membrane of the alimentary tube is much more frequent than acute, of which it may either be a consequence, or it may exist as an original and independent disease. It is very common in dyspepsia, diarrhœa, dysentery, and infantile cholera, of which and of almost all protracted fluxes of the bowels, it is the principal cause, these affections themselves being merely the symptoms. Though not so immediately dangerous as acute inflammation, this disorder is usually very difficult to be dislodged from the stronghold which it takes on the part, and from the insidiousness of its attack, weeks and months sometimes elapsing before it induces any decided constitutional disturbance.

The anatomical characters of chronic inflammation differ, in many essential points, from those of the acute variety of the disease. As a general proposition, it may be stated that the appearances vary according to the duration of the malady, and the nature of the exciting cause, together with several other circumstances which it is unnecessary to specify. Thus, when the disease is of recent standing, we usually find the mucous membrane of a dusky red, inclining to mahogany; whereas, in the opposite state, especially when the attack is one of considerable intensity, it is of a livid, purple, or mulberry aspect. Though the discoloration is occasionally diffuse and uniform, yet in the great majority of cases it occurs in small patches, stripes, or bands, leaving the intervening surface of the natural hue. As in the acute form of the disease, so in this, the color, whatever be its nature, is closely identified with the mucous texture, and therefore always removable with much difficulty by maceration; artificial injection, also, is no longer practicable, at least to any degree of minuteness. The vessels upon which this discoloration depends are generally disposed in arborescent lines, and, what is remarkable, and serves to distinguish this from mere congestive vascularity, is, that they cannot be traced to any particular trunks, but seem as if they were lost in the midst of the inflamed tissues. But it is not always that the diseased membrane is heightened in its color. Often, indeed, it is preternaturally pale, as if it had been bleached and drained of its fluids, and in such cases, also, it is generally very flabby and relaxed. Such an occurrence is by no means infrequent in chronic diarrhœa and infantile cholera.

A very common appearance in this disease is a slaty, bluish, or blackish discoloration, occurring in spots, from the size of a five cent piece to that of a dollar. The parts in which it is most frequently met with are the colon and the rectum, where it is sometimes diffused over a large extent of surface. In the stomach and small bowel, where it is usually more limited, it is commonly most dictinct along the temporary folds and winking valves, for what reason it is not easy to determine. The discoloration, which runs through a great variety of shades, from light slate to jet black, is seldom witnessed except in cases of long standing, or in such as are characterized by a considerable degree of intensity, and probably always results from an extravasation of blood into the submucous cellular texture. Its seat, however, is not, as might be supposed, confined to this substance: often, indeed, it involves in a special manner the mucous membrane, the follicles, and even the villosities; and cases are not wanting, though they are uncommon, in which it penetrates all the tunics at the same time, tinging the tube externally of a greenish, brownish, or sooty dye.

In chronic inflammation, the substance of the mucous membrane is generally thickened, and its density augmented, so that it can no longer be torn with the same facility as in the normal state. The mucous follicles are also more or less enlarged, forming, in many instances, hard, granular bodies, which project considerably above the level of the surrounding parts. Nor is the hypertrophy—for such it really is—always confined to these structures. The villosities, small as they naturally are, are often involved in the disease, and sometimes attain an astonishing development. Owing to these alterations, the surface of the mucous membrane is usually rough, and occasionally even cellulated, like a honey-comb. This, however, is by no means a uniform occurrence; for cases are frequently witnessed, and those even of long standing, in which the part is perfectly smooth and polished, not a gland or villosity being anywhere perceptible.

In the stomach the thickening of the mucous coat is more usually uniform, and the tissue is frequently raised into folds separated by depressions. On this appearance, termed "mammillation" by the French pathologists, much stress is laid by some writers. It may, however, occur in health. Dr. Handfield Jones, in making minute examinations of the stomach, often met with this condition where the mucous membrane was nearly or quite healthy. In the depressed portions atrophy of the tubular glands is commonly found.[1] The same writer has made some very interesting observations on the atrophy of the glandular tubes of the stomach in general. It would seem that they frequently become wasted, and replaced by a fibroid or granular matter. Yet, notwithstanding the changes in these important constituents, the organ does not, in general, seem to lose its power of digestion.

When, as sometimes happens, the inflammation of the mucous membrane assumes a more acute form, the mucous texture undergoes still further changes, or, more correctly speaking, it assumes very different characters. It loses its hardness and tenacity, and is converted into a soft, thick, pulpy substance, which is infiltrated with various

[1] Observations on the Stomach. London, 1855.

kinds of fluids, such, for example, as serosity, pus, or blood, either alone, or in combination. If the morbid action be of long continuance, the mucous tunic is apt to give way, and to form ulcerations, which extend, by degrees, to different depths in the tube. If, on the other hand, the disease retrogrades, the membrane, although it loses its dark complexion, remains preternaturally soft, spongy, and tumid.

In chronic, as in acute inflammation, the vessels of the part always retain their unnatural volume for some time after the main disease has subsided; and cases are observed in which the veins have quite a tortuous and varicose disposition, forming thick whirls underneath the mucous tunic. This appearance is particularly liable to attend chronic inflammation of the stomach, colon, and rectum.

Another effect of chronic inflammation of the stomach and intestines, especially of the latter, is a contraction of their cavities. The colon may be diminished to less than the size of a healthy ileum. The walls of the intestines are then denser and thicker, or softer, and even occasionally atrophied.

An enlargement of the muciparous follicles, from partial closure of their orifices, and the consequent retention of their secretions, is another effect of chronic inflammation. In this manner little cysts are formed, from the size of a millet-seed to that of a pea. They are isolated, or grouped, transparent, elastic, rounded, or ovoidal, embedded in the submucous cellular tissue, and raised above the level of the villous membrane. Their surface is often pervaded by minute straggling vessels, the red color of which beautifully contrasts with the white appearance of the enlarged gland. Their contents are usually thick and glairy, like the white of eggs, but sometimes they are watery, or of a pultaceous consistence, like that of porridge or soft boiled rice. In old cases, the walls of these cysts are occasionally opaque, speckled, and transformed into a tough fibrous tissue. Their most common seat is the large bowel, but they may occur in any portion of the subdiaphragmatic portion of the alimentary canal. They are much less common in the human subject than in the horse, in which they may acquire the volume of an egg, or of an orange. Similar bodies have been found in dogs, sheep, and pigs.

Finally, chronic inflammation of the mucous membrane may cause the formation of warty excrescences and hypertrophy of the submucous cellular tissue.

The *secretions* in this disease present several important varieties. Most generally they consist of a thick, ropy, inodorous mucus, discharged in considerable quantity by stool; not unfrequently, however, they are of a thin, gleety nature, and the cases are not uncommon wherein they are serous, sanious, purulent, or fibrinous. Occasionally, again, though this is rare, the evacuations are thin, greasy, and of a singularly cadaverous smell.

## SECTION III.

### SOFTENING OF THE GASTRO-ENTERIC MUCOUS MEMBRANE.

There are two kinds of softening of the mucous membrane of the alimentary tube, differing from each other widely in their nature, and therefore entitled to separate consideration. The one is caused by inflammation, the other by the action of the gastric juice. The former is usually limited to the mucous and submucous tissues, whereas the latter frequently produces extensive erosions and perforations of the canal.

1. *Inflammatory Softening.*—Softening of the mucous texture from inflammation is most commonly noticed in the lower third of the ileum, the cœcum, the right and left portions of the colon, the stomach, and the rectum, the frequency of its occurrence being very nearly in the order here enumerated. In the majority of cases, it is confined to particular parts of the digestive tube; but, in some rare instances, it extends through its entire length, from the cardiac orifice to the anus. Although the softening seems to be occasionally limited to the mucous corion, villosities, or follicles, yet most generally it occurs in all these structures at the same time, converting them into a pulpy, homogeneous substance. Under certain circumstances, it is possibly capable of invading all the tunics of the stomach or intestines, proceeding successively from the mucous membrane to the subjacent cellular texture, and from the latter to the muscular and serous layers, so as to give rise to perforations, with a discharge of the contents of these reservoirs.

Inflammatory softening is usually somewhat gradual in its progress, running through several well-marked *stages* before it attains its full development. In the first stage, the mucous membrane is remarkably brittle, and breaks as soon as it is seized with the forceps, allowing itself no longer, as in the sound state, to be detached in small, narrow strips; in the second, the cohesive powers are so far destroyed that, by merely passing the finger over it, it may be converted into a soft, grayish pulp, very analogous to thick cream; and, in the last stage, the disorganization is such that the mucous membrane may be easily removed by a small stream of water poured upon it from the height of a few inches. When the softening has attained this degree of development, it is not uncommon to find considerable portions of the mucous membrane detached, by the passage simply of the fluid contents of the alimentary tube; and in this way may be produced numerous abrasions, of a circular, oblong, or linear configuration, from the size of a split pea to that of a dollar, or even the magnitude of the hand. The edges of these abrasions are generally clean and even, their surface being formed by the submucous cellular tissue, which is itself often in a state of partial disorganization. The denuded patches, especially when small and circular, have occasionally the appearance of ulcers; but, in all cases of doubt, the handle of the scalpel, carried lightly over the part, will enable us to determine their true nature. If the membrane sloughs away to a very great extent, as sometimes happens, the margins of the sore, instead of being rounded, as in the former case, will be irregularly bevelled off, and run insensibly into the surrounding parts. In cases of this description, too, it is not unusual to find shreds of the mucous membrane stretched across the denuded surface, so soft as to render it impossible to lift them with the forceps.

Considerable diversity prevails in respect to the *color* of the softened membrane, different shades of tint marking different cases, and even the same case in different regions. In general, the membrane is of a pale bluish aspect, one or two degrees lighter than in the normal state; and not unfrequently it is of a dead white, like milk or cream. This variety of softening is very common in consumption, in mesenteric disease, and in all affections attended with much emaciation. It is the white or "pultaceous" variety of Louis and Cruveilhier, the latter of whom distinguishes from it that peculiar transparent gelatiform softening, which always proceeds from the interior to the exterior coat, invading layer by layer until the walls of the portion affected resemble jelly. The vessels around the softening mass are black. This kind of softening occurs both in the stomach and intestine, and especially in very young children, as a consequence of eruptive fevers, of cholera, and of hydrocephalus. Its causes are obscure. Rokitansky, noticing the frequent coexistence of this form of softening of the stomach with affections of the brain, concludes that it is owing to a faulty innervation of the organ produced by a morbid state of the pneumogastric nerve, and to an increased acidity of the gastric juice. It certainly does not seem to stand in the relation of inflammation. In other cases, again, the membrane presents various shades of red, brown, or purple, or, perhaps, even retains its natural hue. The dark color is probably owing to the presence of a large amount of blood in the softened tissue. This form is frequently observed in acute diseases. Occasionally the discoloration is rigidly limited to the part affected, especially in the pale variety; but in most instances it extends to the neighboring parts, which at the same time exhibit all the phenomena of ordinary hyperæmia.

The bloodvessels in this disease have a singularly flattened appearance, and many of them are partially obliterated, no doubt from their participating in the softening. Injecting matter can no longer be forced into them, and their contents often escape, so as to form small dark-colored ecchymoses, resembling the black spots observable in the stomach of those who die of yellow fever.

The lesion now under consideration is exceedingly common. Although it is occasionally limited to some particular portion of the alimentary tube, yet, in by far the greater number of subjects, it occurs simultaneously in the stomach, the ileum, and large bowel. In some instances, it involves an immense extent of surface, as one-third, a half, or even two-thirds of the gastro-enteric lining. It may be the only disease, or it may exist with other affections, such as ulceration, extenuation, or thickening; but, however this may be, the anatomical characters do not differ from those we have just pointed out. Inflammatory softening of the mucous membrane is frequently witnessed in bilious and typhoid fevers, in dyspepsia, in phthisis, pneumonitis, diarrhœa, and dysentery. I have likewise noticed it repeatedly in infantile cholera, especially in the chronic form of that disease, of which it often constitutes the principal evidence. In nearly all the dissections which I have made of subjects who died of this malady, the softening was particularly observable in the mucous lining of the colon and stomach. In a few instances it was also noticed in the lower half of the ileum.

2. *Softening by the Gastric Juice.*—The second species of softening is produced by the action of the gastric juice after death, and is therefore most common in the stomach. The reason why this effect does not occur during life, is the constant resistance afforded by the vital principle. That it should take place after death is not surprising, when it is remembered that the gastric juice generally contains a certain quantity of free muriatic acid, which must thus greatly increase its eroding properties. These properties are easily neutralized by magnesia, soda, and potassa, as has been proved by experiments on animals, and upon the human subject after death. It has also been ascertained that if gastric juice, however acid, be introduced into the stomach of a living rabbit, no sensible effect will result from its contact with the mucous coat of the organ, for the reason just mentioned.

With respect to its *site*, it is worthy of notice that this variety of softening always takes place at the great cul-de-sac of the stomach, in consequence of its depending position favoring the accumulation of the gastric acid, as well, perhaps, as from this fluid being secreted here in larger quantity than elsewhere. The only exception to this rule arises where there is an enlargement of the spleen, or some tumor pressing this part of the organ up, and thereby rendering the pyloric extremity the lowest point. When there is softening of the intestines, with erosion and perforation, it invariably occurs in the loups lodged in the epigastric region, in close proximity with the stomach. Under no circumstance, at least so far as my observation extends, has this variety of mollescence been noticed in the lower portions of the digestive tube, or in the urinary bladder.

The *extent* of the lesion is very variable, being either limited to a small portion of the stomach and bowels, or occupying the whole surface of the former, with a considerable portion of the latter. Occasionally, it is observed entirely in the intestines, which can only be explained on the assumption that the gastric acid, having left the stomach, has accumulated in inordinate quantity in the latter organs. When the softening is accompanied with perforation, it may extend to the œsophagus, liver, spleen, diaphragm, and even the lungs, all of which viscera may therefore be affected in the same individual, and exhibit various degrees of dissolution.

The *form* in which the softening presents itself varies in different parts of the digestive tube. When confined to the fundus of the stomach, the lesion generally occurs in irregular patches, varying much in size, the edges of which are formed by the mucous membrane, and their surface by the subjacent cellular texture. Very generally the margins of the erosions are thin, soft, ragged, and transparent. When the softening penetrates beyond the muscular tunic, the margins are bevelled outwards, and terminate in delicate and irregular processes, which exhibit a tattered, shred-like appearance on being immersed in water. The same form precisely is perceived when the lesion affects the peritoneum. This patch-like softening usually takes place whenever the mucous membrane happens to be stretched; but should it be thrown into folds, it will assume a different shape, and occur in stripes and bands of a light bluish tinge, forming thus a striking contrast with the sound surface, which is either of the natural color, rosaceous, or of a light vermilion. These stripes and bands, it should be stated, always correspond with the situation and direction of the mucous wrinkles, the intervals between them being very slightly or perhaps not at all changed in their consistence; a circumstance which may easily be recognized by floating the parts in clear water. Occasionally, though very rarely, the softened membrane is of a light orange hue; and the vessels traversing it, if there be any, which, however, is not always the case, are filled with black blood, which, as I have repeatedly witnessed, is insusceptible of any change upon exposure to the atmosphere. Redness of the affected texture is never observed; its existence being incompatible with the chemical action of the gastric acid.

The *degree* of softening presents several important varieties. At first the membrane has very much the same consistence as in mollescence from inflammation; but, as the process advances, it is gradually converted into a grayish, pulpy substance, which can be easily removed with a sponge or by a stream of water, leaving the submucous cellular tissue of a dark silvery color. Instances occur, especially in young children, in which the membrane is reduced to the consistence of a hot solution of starch, arrowroot, or isinglass.

The *rapidity* with which softening, erosion, and perforation of the stomach may take place in the human subject, is well illustrated in a case which I had an opportunity of examining along with Dr. Mount. It occurred in a female infant, seven weeks old, who was found dead one morning in her mother's arms, having expired apparently without a struggle. A month previously, this child had had a severe cough, which continued for eight or ten days, when it gradually abated. It was also harassed, every evening for several weeks, with regular paroxysms of retching and vomiting, attended with occasional colicky pains, and latterly with diarrhœa.

On inspection, nine hours after death, numerous apoplectic effusions, from the size of a currant to that of a pea, were discovered in the pulmonic tissue, which, together with the universal engorgement, the injected condition of the bronchiæ, the distension of the right cavities of the heart, and the absence of any structural lesion, save a slight degree of hepatization of the inferior lobe of the left lung, made it sufficiently clear that the child had died of suffocation. In the great cul-de-sac of the stomach existed a rounded opening, with ragged edges, about the size of a dollar, through which had escaped a small quantity of mucus and gastric acid. The concave surface of the spleen was of a pale color and macerated appearance; the contiguous portion of the omentum was slightly softened, and perforated at two places. The mucous membrane around the opening in the stomach was of the natural complexion and consistence, nor was there anywhere the slightest sign of disease.

---

## SECTION IV.

### DISEASES OF THE STOMACH.

1. That *ulceration* of the stomach should occasionally occur, is not surprising when we take into consideration the great extent of its surface, the delicacy of its organization, the variety of its functions, its important sympathetic connections with other organs, and the heterogeneous nature of its contents. Yet, that this event is much less frequent than was at one time supposed, is abundantly proved by the general experience of the profession; at least it is so in this country. Extensively as I have been engaged in pathological researches, I have seldom met with this lesion, notwithstanding I have used the utmost care in cleansing and inspecting the mucous coat.

Ulcers of the mucous membrane of the stomach are seldom either large or numerous. Most generally, indeed, there is only a single one, which is then, perhaps, of considerable size. Occasionally, however, they are extremely numerous, as in the case of a man of thirty-three, in whom I counted upwards of sixty. When they are seated in the glands of Brunner, as happened in the instance just referred to, they are almost always much smaller than when they affect the intervening texture, their magnitude rarely exceeding that of a split pea. In the other variety, they often attain the size of a Spanish dollar, especially when solitary; and instances are not wanting in which they are much larger.

Not less variable are the shape and depth of these erosions. Their most common appearance is that of depressed breaches of continuity of the mucous corion, of a roundish form, with edges slightly elevated above the level of the internal surface. Not unfrequently, however, they are remarkably irregular, their margins being hard, thick, fissured, and even granulated. Appearances like these are especially observable in old chronic cases, but are very rare in such as are recent. We often see the edges partially undermined, so that, upon being floated in water, they present the ragged, shreddy aspect, so common in ulcers of the large intestine.

The bottom of the ulcer may be formed by the cellular tissue, or it may extend through this and the muscular layer, so as to lie upon the peritoneal covering. In the latter case, it is not uncommon for perforations to take place, and for the contents of the stomach to escape into the abdominal cavity or into some one of the neighboring organs. Most generally a communication is established with the arch of the colon, the walls of which, as the erosive process extends, are firmly cemented with those of the stomach, by means of lymph. In this way, the individual may sometimes live for years, with very little inconvenience. Oftentimes the bottom of the sore is hard and thickened, from the hypertrophous condition of the subjacent textures, or, as more rarely happens, from a deposition of small patches of lymph. Its color is usually pale; but it may be of a light rose tint, brownish, or crimson. Under hardly any circumstances is the base of the sore of so deep a hue as the edges.

It has been already mentioned that ulcers of this organ are occasionally followed by *perforation*. Of fifty-one cases of this accident, analyzed by Mr. Edward Crisp, of England, thirty-nine were females and twelve males. Of the former, twenty-one were between fifteen and twenty years of age; ten between twenty and twenty-five; five between twenty-five and thirty; one was forty, one fifty, and one sixty. Of the males, only one was under twenty years of age. The aperture in the majority of the female patients was situated in the smaller curvature of the organ, more frequently between the pyloric and cardiac orifices, but in many instances near the latter. In one case only was the perforation close to the pylorus. In nine examples, two ulcers were present, being situated opposite to each other; so that, when the stomach was in a state of collapse, the diseased parts were in contact. The period which intervened between the perforation and the death of the patient varied from twelve to thirty hours. In one instance, life was prolonged for nearly three days. The lesion usually occurred a short time after a meal.

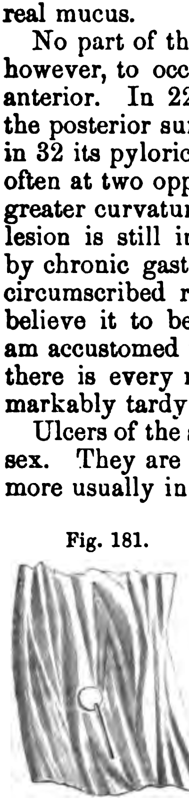
Not the least interesting circumstance connected with the history of ulcers of the stomach is that they occasionally undergo a process of *repair* similar to the cicatrization of ulcers of the skin. The possibility of such an occurrence was long questioned, but has been abundantly established by modern observation. I have myself seen several well-marked cases of it; among others, that of a young female, who had been laboring for a long time under all the symptoms of chronic gastritis, attended with extreme emaciation. In the posterior wall of the stomach, nearly midway between the great tuberosity and the pyloric extremity, was an old ulcer, about the size of a five franc piece, the edges of which were puckered, thickened, and completely cicatrized. All the tunics were destroyed; and the contents of the organ were prevented from escaping only by the manner in which it was glued to the anterior surface of the pancreas, which thus formed the bottom of the erosion. The rest of the stomach was perfectly sound, excepting that its coats were much thinner than usual, and remarkably blanched.

Such a repair, however, is always difficult, from the surface of the sore being constantly exposed to the irritating contents of the organ, by which the salutary efforts of nature must be very frequently baffled. The first step in the process is an effusion of fibrin, by which the loose margin of the ulcer is tied to the subjacent parts. By degrees, a similar substance is deposited upon the bottom of the sore, which, in time, is transformed into a granulating surface, bathed with a thin muco-purulent fluid. Thus, day after day, the process proceeds until the cicatrization is completed, the ulcer in the mean time diminishing in size, and acquiring a bluish, puckered appearance. The new product, however, although it occasionally attains the consistence and thickness of the natural membrane, is yet essentially different, being less smooth, less vascular, more easily destroyed by subsequent attacks of disease, destitute of follicles, and, therefore, incapable of secreting real mucus.

No part of the stomach is exempt from ulceration. It would seem, however, to occupy the posterior surface more frequently than the anterior. In 220 cases, analyzed by Dr. Brinton,[1] the ulcer occupied the posterior surface of the stomach in 86; in 55 its lesser curvature; in 32 its pyloric extremity; in 13 its anterior and posterior surfaces, often at two opposite places; in 10 its anterior surface only; in 5 its greater curvature; in 4 its cardiac pouch. The exact cause of this lesion is still involved in obscurity. It is generally accompanied by chronic gastritis, and is supposed by some to commence with a circumscribed red softening of the mucous membrane, whilst others believe it to be merely the result of a defective local nutrition. I am accustomed to look upon it as the result of inflammation, although there is every reason to believe that this is very often not only remarkably tardy in its progress, but of an extremely low grade.

Ulcers of the stomach affect more frequently the female than the male sex. They are rarely observed after the age of thirty-five, and occur more usually in the poor than in the rich. Needlewomen and maid-servants, between the ages of eighteen and twenty-five, seem to be particularly liable to them.[2] Ulcers of the stomach may end fatally by inducing exhaustion, hemorrhage, or perforation.

Fig. 181.



Ulcer of the stomach from a pin in its walls. From a specimen in my collection.

Ulcers of the stomach are sometimes produced by the presence of a foreign body, as a needle, pin, or piece of bone, fixing itself in its coats. The adjoining cut (Fig. 181), copied from a preparation in my cabinet, exhibits such an occurrence from the effects of a pin, which is seen lying across the ulcer, which was of a circular shape, and hardly a line in diameter, with hard, almost callous, edges, well rounded off by the process of repair. The ulcer had perforated the different tissues of the stomach, the contents of which were prevented from escaping by the adhesion of the organ to the colon.

2. *Hypertrophy* of the stomach is by no means so uncommon as was formerly supposed. Excepting the peritoneal, it may invade all the tunics simultaneously, or be confined to a single one, which is, in fact,

---

[1] Brit. and For. Med.-Chir. Review, January, 1856.

[2] Budd on Diseases of the Stomach, London, 1855, p. 98; Am. ed.

most generally the case. Sometimes the enlargement mainly attacks the mucous follicles, giving the internal surface of the organ a rough, mammillated fulness, the widened orifices of the glands identifying the seat of the affection. This state of the mucous membrane of the stomach is caused by chronic inflammation, and is often observed in phthisis, in diabetes, and in chronic disease of the bowels. The mammillated prominences, which are generally of a rounded, conical shape, and from the size of a large pin-head to that of a currant, strongly resemble the granulations of an old ulcer, and are occasionally separated by deep narrow grooves, running in different directions. Their length is subject to much variety. In some instances, it does not exceed half a line; in others, it is more than a third of an inch. In my own dissections, I have invariably found this mammillated appearance of the mucous coat most conspicuous in the inferior half of the organ.

The mucous membrane in this affection is usually of a pale reddish tint, like the surface of an indolent ulcer; occasionally, it is almost white, grayish, or drab-colored. In most cases, it is abnormally firm and thick, allowing itself to be raised in large shreds. The villosities are also sometimes much augmented in size, and truly hypertrophous.

To the same class of lesions are to be referred those singular looking *warty excrescences* which are sometimes observed upon the mucous membrane of the stomach. Their shape is generally rounded; their size is inconsiderable; and, in most cases, they adhere by a narrow footstalk, of considerable length. Much diversity prevails in regard to their internal structure, which is sometimes fibrous, sometimes fungous, sometimes vascular and erectile. Their color varies in different cases, being for the most part grayish, but occasionally reddish, brownish, or blackish.

Hypertrophy of the *submucous tissue* is characterized by considerable thickening and induration, with or without change of structure of the other tunics: the areolar texture is destroyed, and replaced by a dense albuminous substance, which may be so firm as to prevent the stomach from collapsing when opened. There is some variety in the color of the affected part. Occasionally it bears some resemblance to a mixture of beeswax and tallow; more commonly, however, it presents the appearance of a piece of well-boiled tripe, with some sections of it more transparent than others. The hypertrophy is not always limited to the submucous cellular tissue. Cases are frequently met with in which it involves the subserous substance, and even that between the muscular fibres, rendering the latter pale and thin, or else remarkably large and distinct.

Hypertrophy of the *muscular coat* varies in different cases. It may be very slight—perhaps hardly perceptible—or it may amount to an enormous degree, both as regards its thickness and the extent of surface which it occupies. It rarely pervades the whole organ; on the contrary, it usually occurs in considerable sized patches, either alone, or in union with hypertrophy of the cellular tissue. In this affection, the muscular fibres are uncommonly large and distinct, hard, more dense and florid than in the natural state, forming frequently thick, membranous intersections, and producing an appearance not unlike that of the inner surface of the heart. The individual fasciculi are often several lines in diameter. In most instances of this species of hypertrophy, the patient labors under cancer, or some other disease which forces the organ habitually to reject its contents. It is also sometimes noticed in great eaters.

3. *Atrophy* of the stomach is usually caused by protracted abstinence, cancerous affections, or protracted pressure, as from an enlarged spleen, liver, or omentum, thus impeding the process of nutrition and of innervation. It is characterized by remarkable pallor and attenuation of the organ, which is reduced to a soft, flabby substance. The peritoneal covering seems as if it had been bleached; the muscular fibres are scattered, and almost colorless; and the mucous membrane is diminished in thickness, pallid, deprived of its villosities, and scarcely capable of being separated from the subjacent textures. A degree of atrophy like this, however, is extremely rare. Partial attenuation is more commonly observed at the great cul-de-sac than in any other portion of the stomach. In several instances, I have also seen it just below the cardiac extremity.

4. *Dilatation* of the stomach may arise from excessive gluttony, or from the effects of protracted disease, especially of the pylorus. The affection presents itself in various degrees, and may, or may not, be associated with hypertrophy or atrophy of the several coats of the organ. One of the most remarkable cases of dilatation of the stomach that I have ever witnessed came under my observation, in 1854, in a married lady, twenty-eight years old, where the immediate cause seemed to be paralysis of the muscular fibres, preventing the viscus from contracting upon its contents, and producing death by constitutional irritation. The patient had been long dyspeptic; and one day, soon after making a hearty meal upon strawberries, she was seized with violent colicky pains, attended with excessive nausea, but inability to vomit. A large tumor existed in the epigastric region, extending over into the left side and nearly down to the umbilicus; it felt hard, and was quite tolerant of manipulation. The bowels were obstinately constipated. She expired in less than a week from the commencement of the attack. On dissection, the stomach was found to be immensely enlarged, and to contain upwards of a gallon of ingesta. Its tunics were entirely free from inflammation, nor was there any evidence of disease in any of the other viscera.

It is astonishing to what extent the dilatation of this organ may sometimes proceed. In a case observed by Dr. Yvan, of Paris, the length of the great curvature was three feet, the circumference at the widest part twenty inches, and the capacity nearly a gallon and a half. The muscular fibres, longitudinal as well as circular, although considerably attenuated, were quite distinct throughout the greater part of the viscus. The organ lay parallel to the axis of the body, and was of a constricted, hour-glass figure, one part being situated in the abdomen, the other in a large scrotal hernia.

5. Inordinate *contraction* of the stomach is occasionally met with, chiefly as a result of stricture of the œsophagus, or of the cardiac ex-

tremity of the viscus. Protracted abstinence may also induce it. The occurrence is usually associated with atrophy, and may be so great as to diminish very seriously the capacity of the organ for the reception of food and drink.

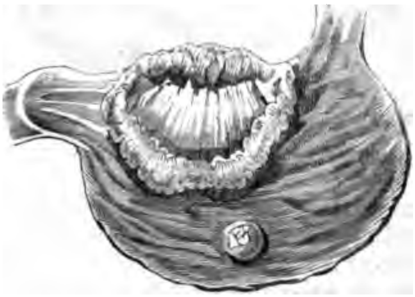
6. A part of the stomach is occasionally converted into a *pouch*, produced, apparently, by a rupture or separation of some of the muscular fibres, and a consequent protrusion of the mucous membrane. In this manner a sac may be formed, capable of holding several ounces, and looking very much like a supplementary reservoir. Such productions have no definite shape; they are met with chiefly along the great cul-de-sac of the organ, and their walls are usually very thin, consisting exclusively of the mucous and peritoneal investments.

7. Pieces of *fibro-cartilage* are sometimes found in the stomach, either between the mucous and muscular tunics, or between the latter and the peritoneal. Of a pale grayish, or bluish aspect, they are of a dense gristly texture, grating sensibly under the knife, of an irregular shape, and of variable extent, from that of a split pea to that of a twenty-five cent piece and upwards. Occasionally the new substance presents itself in the form of irregular nodules, projecting into the cavity of the reservoir beneath the lining membrane. In cases of long standing the deposit is sometimes partially ossified.

8. Various kinds of *tumors*, benign and malignant, occur in the stomach. The older writers have much to say about steatomatous growths of this organ, which they describe as being always encysted, and as containing a semi-concrete substance, resembling suet, tallow, or soft wax. Few modern observers have met with such cases, and still fewer believe in their existence. Ruysch possessed a tumor which consisted of hair and teeth that had been taken, after death, from a cyst in the coats of a man's stomach. Polypoid growths of this organ are very rare. Of a reddish color and of a firm consistence, they are usually of an ovoidal figure, of a fibroid structure, somewhat rough on the surface, and from the size of a hazel-nut up to that of an orange; their attachment being generally effected by a short, slender pedicle.

9. The stomach is more liable to *carcinoma* than any other portion of the alimentary canal, except the rectum. The disease is almost peculiar to old age; and the parts most frequently attacked are, first, the pylorus, secondly, the cardiac extremity, and thirdly, the body of the organ. The morbid deposit may be limited to particular situations, or it may affect nearly the whole stomach, the coats of which it transforms into a dense, gristly substance, intersected by whitish membranous bands, with hardly a vestige of

Fig. 182.



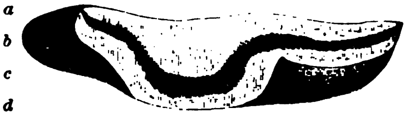
Cauliflower cancer of the stomach. From a preparation in my collection.

the original structure. In some instances the diseased mass exhibits a peculiar cauliflower arrangement, as in the accompanying cut, from the stomach of an old man of sixty-three, preserved in my cabinet. This form of cancer, however, is very uncommon. In the case adverted to the disease had existed nearly four years before it proved fatal.

In general the malady appears in the form of distinct tumors, or nodules, varying in volume from a small nut to a goose's egg. With a surface that is often very rough, irregularly mammillated, or marked off into numerous lobules, they are found to exhibit a great variety of texture, some parts being fibrous, some fibro-cartilaginous, some osseous, some mammary or lardaceous, some fungoid, some medullary, some gelatiniform, and some hæmatoid. It is seldom, however, that these substances are thus combined. Commonly, indeed, not more than two or three coexist, and in many cases they occur separately. The most common form is the scirrhous or fibrous, next the medullary, or a mixture of the two; the least frequent of all being the colloid. The cancer often commences as a fibrous substance, and afterwards, as its development proceeds, other textures are superadded; or such as previously existed are partially transformed. Cancer of the stomach is almost always a primary disease; the neighboring lymphatic glands and the pancreas may become secondarily involved. The first deposits generally occur in the submucous tissue, which is usually dense and of a dull color.

The mucous membrane, in carcinomatous disease of the stomach, is variously affected. In general it is very much thickened—sometimes as much as a fourth of an inch—indurated, elevated into irregular masses, and of a light grayish color. Occasionally it is of a dull yellowish, greenish, or light mahogany tinge, soft, pulpy, or almost brain-like, vascular, ulcerated, or partly destroyed. Several of these morbid alterations are generally met with in the same specimen. The muscular fibres are unnaturally distinct; and the peritoneal tunic, although it does not always participate in the disease, is often much thickened, and almost of a gristly consistence. The various changes experienced by these structures are well illustrated in the adjoining cut (183). The stomach is commonly diminished in its capacity, and contains a very offensive gas, with a small quantity of dark colored fluid, like coffee-grounds. The neighboring lymphatic ganglions, even at a tolerably early period, are more or less enlarged, red, and softened; as the deposit progresses those nearest the tumor become involved in the carcinomatous disease. The submucous cellular tissue is sometimes the seat of hemorrhagic effusions, and blood is also occasionally poured into the cavity of the organ, either as an exhalation, or as a consequence of the rupture, or ulceration of some of the vessels. With regard to the minute structure of cancerous tumors of the stomach, it is deserving of notice that the ordi-

Fig. 183.

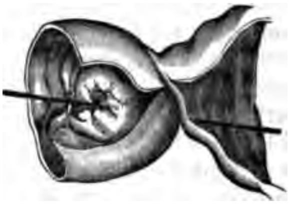


Section of a scirrhous stomach; *a* The mucous membrane; *b*. Submucous cellular substance; *c*. Muscular fibres; *d*. Peritoneal coat. From a specimen in my cabinet.

nary large cells and corpuscles met with in cancers generally, are seen in only a certain proportion of cases. Frequently the tumors consist of nothing but fibrous tissue and a few elongated nucleated cells.

When the disease is seated at the pyloric extremity, this part is more or less changed in its character. The heteroclite matter may present itself in the form of a distinct layer, of variable thickness and consistence; or, it may occur as a solitary tumor, of a pale bluish color, rounded or ovoidal in its shape, knobby, and as large as a pullet's egg, or an orange. In its structure it may be scirrhous, cerebriform, or colloid, according as there is a predominance of one or another of these substances. The pylorus itself may be natural or only slightly changed; but in general it is transformed into a thick, hard, gristly ring, the orifice of which may be so much contracted as scarcely to admit the end of the little finger. In some of the preparations in my possession the opening is reduced to the size of a goose-quill. The coats, both of the stomach and duodenum for some distance above and below the tumor, are thickened, altered in color, and augmented in consistence. The liver and pancreas are often diseased, from their proximity to the seat of the morbid growth; and the pyloric extremity occasionally adheres extensively to the surrounding parts. Scirrhus of the pylorus is exhibited in the accompanying cut (Fig. 184), in which the heteroclite matter presents itself in the form of a tumor, rough, knobby, ulcerated at the centre, and projecting slightly into the duodenum.

Fig. 184.



Scirrhus of the pylorus. From a specimen in my collection.

10. The stomach, like other hollow viscera, is liable to *laceration.* The causes are external violence, as a blow or kick, straining at stool, and efforts at vomiting. The accident may happen when the organ is perfectly healthy, or it may be preceded by ulceration, softening, gangrene, or cancerous degeneration. In the inferior animals the laceration is sometimes produced by over distension from gas; but no such case, that I am aware of, is recorded as having occurred in the human subject. When the viscus is diseased, the rupture may result from the most trifling exertion.

Rupture of the stomach, attended with perforation and an escape of the contents of the organ, is always fatal, death occurring from a few hours to two or three days after the accident. When the rupture is partial, that is, seated in the mucous or serous membrane, the breach may be repaired in the ordinary manner; or, as in the latter case, the organ may contract adhesions with the surrounding parts, and thus further mischief be prevented.

## SECTION V.

### DISEASES OF THE DUODENUM.

The organic lesions of the duodenum are in many respects so peculiar as to deserve a brief separate notice. Nor are they uninteresting on another account. From the close proximity of the organ to the stomach, liver, gall-bladder, and small intestine, with all of which it may be said to be directly continuous through the intervention of its mucous lining, disease can hardly ever exist in one of these structures without implicating the other. Nowhere, indeed, is there a more striking instance of the operation of what Mr. John Hunter and his followers have denominated contiguous sympathy, than in the viscera now under consideration. What takes place in the conjunctiva of the eye, in severe inflammation of the Schneiderian membrane of the nose, may be supposed to occur in the inner coat of the gall-bladder and in the hepatic ducts, in acute duodenitis. Here disease is directly propagated from one part to another, because of the similarity of structure of the lining membrane; nor is it uncommon to find that the organ which is secondarily involved, is obliged to bear the onus of the irritation. In this manner, there is reason to believe, is often produced congestion of the portal system; the disease, in the first instance, being, perhaps, merely an acute inflammation of the mucous membrane of the duodenum or stomach, which, by propagation, involves the corresponding tissues of the liver and gall-bladder, and thus causes that profound obstruction so much insisted upon by some pathologists.

This mode of accounting for the occurrence of certain forms of portal congestion will appear the more plausible, if we reflect upon the immense size of the liver, and upon the fact that the excretory tube of each of its component granules is lined by a mucous membrane. If this be done, we shall be forced to regard the organ not simply as a parenchymatous structure, but as a mass of mucous follicles, subject to the same disorders as the duodenum, which adjoins it, and which sends into its interior one of its own tissues. Thus it will be perceived how disease may be propagated from one of these viscera to the other; how an irritation, seated in the mucous membrane of the duodenum, may affect that of the liver; how the functions of the latter may be impaired by the former; and conversely, how an inflammation of the liver may be transferred to the duodenum, the stomach, and, perhaps, also to the mesenteric portion of the small bowel, and commit the most serious and extensive mischief.

*Ulcers* of the duodenum, whether originating in its mucous membrane, or in its follicular structure, are extremely rare, and run pretty much the same course as those of the stomach. In ninety-two cases of ulcerated bowel, observed by Andral, only one occurred in the duodenum; and if this be taken as an average estimate, it must be evident that this portion of the alimentary tube is peculiarly exempt from such lesions. That they are infrequent, my own experience abundantly confirms. There is seldom more than one erosion; nor is it very common to observe them below the insertion of the choledoch duct. It is not improbable that the ulcers may heal; nevertheless, owing to the irritating nature of the bile which lies so constantly in contact with this portion of the small bowel, they manifest a remarkable tendency to extend their ravages from the mucous to the other tunics.

When perforations take place, the contents of the tube may, as in the case of the stomach, escape either into the peritoneal cavity, or into some of the surrounding organs. In a preparation in my possession, the duodenum communicates with the fundus of the gall-bladder; and in another, taken from a gentleman sixty-eight years old, with a large pouch formed by the convex surface of the liver, and the contiguous portion of the diaphragm. Without entering into all the particulars of this remarkable, and, so far as I know, unique case, of disease, it may be briefly stated that the outlet of this extraordinary sac was a circular opening, about the size of a half guinea, with thick, rounded, and well-defined margins, which was situated one inch below the pylorus, on the upper wall of the duodenum, which, as well as the arch of the colon, adhered extensively to the anterior border of the liver. Leading from this aperture, in a direction obliquely upwards and outwards, was a narrow tortuous sinus, which, after a course of about one inch and a half, communicated by means of a small, elliptical slit, with the pouch previously adverted to. This artificial reservoir, formed in the manner before mentioned, was flat, circular, a little more than six inches in diameter, and capable of holding about ten ounces of fluid, although perfectly empty at the time of the examination. It was lined throughout, however, by a thick, dense layer of lymph, of a yellow-greenish color, from the intermixture, probably, of fecal matter, which must have passed into it at different times from the perforated duodenum. On cutting into this substance, the hepatic texture was found to be perfectly sound, excepting for about the fifth of an inch in depth, where it was somewhat softened, and of a dark bluish tint. The diaphragm, dark-colored and deeply injected, adhered firmly all around the anterior surface of the liver, the attachment extending about an inch beyond the longitudinal fissure, leaving the remainder of the left lobe perfectly free and healthy. The liver was of the natural size, and, with the exception specified, quite sound. The gall-bladder and other abdominal viscera presented nothing worthy of special notice. The right lung was in a state of purulent infiltration; the cartilaginous rings of the treachea and bronchiæ ossified; the heart softened; the parotid glands enlarged and suppurated.

The subject of this remarkable lesion had been liable, throughout life, to attacks of rheumatism, but had otherwise enjoyed good health. A few years before his death, he gradually lost flesh, his complexion assumed a dark sallow aspect, the skin became dry and bloodless, the bowels were torpid, and the pulse was weak and intermittent. In

April, 1837, he was suddenly seized with excruciating pain in the epigastric region, followed by reduction of temperature and great prostration of strength, with occasional fever, cough, and dyspnœa. After a few days the parotid glands became swollen and indurated. Finally, hiccup supervened, and continued to recur until he expired, nineteen days after the attack.

Cases are occasionally observed in which the duodenum is *ruptured*, apparently without any previous lesion. Of this an interesting instance has been detailed by the late Professor Drake, in his *Medical and Physical Journal* for April, 1839. The patient was a cordwainer, thirty-eight years of age. The symptoms were those, in the first place, of violent colic, and afterwards of acute peritonitis, death occurring in sixty hours from the commencement of the attack. On inspection, the duodenum, at the pylorus, was found to be ruptured more than half way round, the fissure exhibiting the appearance of a clean cut. Through this the contents of the tube, as well as of the stomach, had escaped into the peritoneal sac, and excited fatal inflammation. No ulceration existed anywhere, nor had any part suffered gangrene; in short, there was not the slightest organic change of any kind that could account for the laceration.

Broussais[1] mentions the case of a man, sixty-three years of age, in whom an ulcer was discovered in the upper portion of the duodenum, which had formed a communication with the hepatic artery. The intestinal canal was found full of blood. In a case described by Dr. Streeter,[2] of England, the duodenum opened externally, between the seventh and eighth ribs, by means of a canal two inches and a half in length, through which articles of food and drink were frequently discharged. The tube was greatly contracted beyond the seat of the communication, and the patient lived about a month after it took place.

*Carcinomatous* and other tumors are occasionally found in the duodenum; but this occurrence is extremely infrequent. When seated in the neighborhood of the outlet of the choledoch duct, such tumors, by preventing the flow of bile, may cause distension of the gall-bladder and congestion of the biliary passages, with all the contingent phenomena of jaundice. In the same manner may arise obstruction and enlargement of the pancreas.

The duodenum is sometimes enormously *enlarged*. Cases occur in which its volume equalled that of the stomach. Its tunics are also liable to thickening and attenuation, though much less frequently than those of the rest of the alimentary tube.

---

[1] Sur la Duodénite Chronique.

[2] Midland Medical and Surgical Reporter. November, 1829.

## SECTION VI.

### DISEASES OF THE SMALL BOWEL.

The diseases and injuries of the small intestines may be arranged under the following heads: 1, ulceration; 2, disease of the glands of Peyer, as productive, or concomitant, of typhoid fever; 3, infantile cholera; 4, hypertrophy; 5, atrophy; 6, contraction; 7, tubercle; 8, carcinoma; 9, melanosis; 10, concretions; 11, fatty discharges; 12, laceration; 13, internal strangulation; 14, hernia; 15, abnormal pouches; 16, wounds.

1. *Ulceration.*—Among the most common organic affections of the small intestines, properly so called, are ulcers. Comparatively infrequent in the upper portion of the tube, they always increase as we approach the cæcum; indeed it is not unusual to find them entirely confined to the inferior half of the ileum. In their shape they may be circular, elliptical, or linear, according to the nature of the affected structures, and the progress of the disease. Their dimensions vary from a line to several inches; their margins are ordinarily elevated, ragged, and of a grayish, pink, or rose color, more rarely brownish or blackish; and their bottom is generally formed by thickened and indurated cellular tissue, sometimes by muscular fibres, sometimes by peritoneum. Perforations are not infrequent, the consequences which they occasion being of the same nature as in the stomach, duodenum, or large intestine.

When the ulcers are seated in the isolated follicles, their number is sometimes immense, hundreds being scattered in every direction. Under these circumstances, they are generally of small size, rounded, and in every stage of disorganization, from incipient erosion to the complete removal of the gland.

In the glands of Peyer, the ulcers are not unfrequently seen in thick clusters, resembling the confluent eruption of the skin in smallpox. Their surface is often remarkably uneven, granular, or honey-combed, appearances which are always most conspicuous whenever there is partial destruction of these follicles, with hypertrophy of the intervening cellular tissue. Frequently we see them present an eroded, worm-eaten aspect, with reddened, elevated, and indurated margins. The configuration which these ulcers assume generally resembles that of the glands in which they are situated; that is, they are oblong, elliptical, or circular, and occasionally, as in a case which fell under my observation not long ago, they are T-shaped. When several of the patches run together, they are commonly very irregular, and their dimensions are also much greater, the eroding process going on until the mucous membrane is destroyed over a very considerable extent of surface. Occasionally, all the glands of Peyer are in a state of ulceration; more commonly, however, not more than five or six are involved, and sometimes only a single one is affected.

Follicular ulcers are exceedingly common in the small intestines of phthisical subjects. What the precise proportion is in which they occur in this disease has not been determined. In my own dissections they have been very frequent, so that I seldom fail to find them in greater or less number. They would doubtless be discovered much oftener, both in this and other maladies, if greater care were taken in cleansing and thoroughly scrutinizing the alimentary canal. Follicular ulcers are quite common, according to my observation, in chronic cholera of infants, as well as in chronic diarrhœa and dysentery, though in all these affections they are usually more numerous, as well as more distinctly developed, in the large than in the small bowel.

Ulcers of the small bowel, whether originating in the mucous or glandular texture, can often be recognized, if they are deep, even before the tube is laid open, simply by the translucent and discolored state of the peritoneal covering. The free surface of the bowel is often covered with globules, shreds, or patches of lymph; and sometimes we see it studded with small granulations, which accurately define the seat of the disease. These remarks are equally applicable to deep ulcers of the stomach, duodenum, and large intestine.

It need scarcely be said that these ulcers are susceptible of healing. In my private collection are a number of preparations which beautifully illustrate this subject. In one, the ulcer, about the size of a halfpenny, is of a bluish color, and completely cicatrized, with a smooth, and slightly depressed surface. In the same specimen are several other erosions, some of them perfectly raw, others in a state of partial reparation. Very recently, in examining a female who died of phthisis, I found a small ulcer in the ileum, the cavity of which was nearly filled with hard, solid lymph, of a greenish-yellow color, from the intermixture of fecal matter. For the account of the process by which this cicatrization is effected, the reader is referred to what is said upon the subject, under the head of organic disease of the stomach.

Ulceration of the mucous membrane is occasionally consecutive, suppuration commencing in the subjacent cellular tissue, and elevating the mucous membrane into little abscesses, perhaps not larger than a split pea. After awhile the covering breaks, and thus an ulcer is formed, which runs the same course as in the preceding case. When several of these purulent collections exist in close proximity, they may communicate by means of fistulous tracts, in the same manner as abscesses sometimes do in the subcutaneous cellular tissue.

2. *Typhoid Fever.*—Inflammation of the glands of Peyer has of late years acquired an unusual degree of interest in consequence of an opinion, now pretty general and apparently well-founded, that it constitutes the fundamental lesion of typhoid fever. This disease, which probably occurs in all parts of the world, is generally very slow and insidious in its mode of access. When fully established, it is characterized by great muscular debility, a dull, vacant expression of the countenance, low, muttering delirium, a dry, red, or brownish state of the tongue, black sordes of the teeth, sickness at the stomach, diarrhœa, tympanitic distension of the abdomen, epistaxis, and rose-colored spots on the skin. The latter are present in nearly all cases; they usually appear during the second week of the fever, and continue for six or eight days, when they gradually fade and die away. They are of a

lenticular form, about as large as the head of a pin, of a bright red, or rose color, and slightly elevated above the surrounding surface. The abdomen and chest are their most common seat. Their number varies from a few to several dozens. Sudamina, or minute transparent vesicles, are also pretty frequently present, most commonly on the sides of the neck, shoulder, and chest, rarely on the face, abdomen, or extremities. Of the size of a clover-seed or split pea, they are of a circular or oval shape, and filled with a thin limpid fluid. They seldom occur before the end of the second week.

The diarrhœa, although it may begin at an early period, rarely sets in before the second or third week. It is most severe in protracted cases, and may last for fifteen or twenty days. The stools are thin, watery, fetid, turbid, and of a yellowish, or dark brownish color; they seldom contain mucus, but now and then they are mixed with blood, either liquid or grumous. The tympanitic distension may be slight, or so great as to occasion considerable dyspnœa. Like the diarrhœa, it seldom manifests itself before the middle or end of the second week.

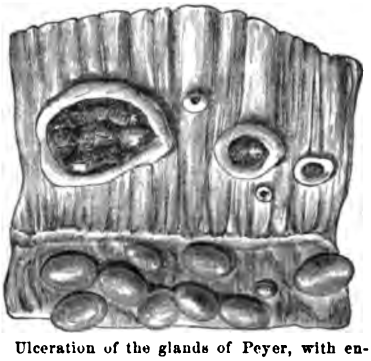
Typhoid fever may probably occur at any period of life, but is most common in young subjects, from the twentieth to the twenty-fifth year. It is rare in childhood, and very few cases occur after forty. The duration of the disease is from a week to two months, the average being from twenty to twenty-five days. The influence of sex, temperament, season, and occupation, in the production of typhoid, is not determined. The malady has been supposed to be contagious, but this also is an unsettled point. It rarely occurs twice in the same individual.

It is not often that typhoid fever proves fatal before the sixth or eighth day, and hence its anatomical characters, at this early stage, are still imperfectly understood. The first perceptible alteration, as it respects the Peyerian glands, appears to be an unnatural influx of blood, in consequence of which they exhibit a rose, pink, or reddish tint, which is either limited to particular points, or diffused over their entire surface. Contemporaneously with this capillary engorgement, or, at all events, within a short period after its occurrence, the affected parts lose their transparency, and are rendered more or less opaque, as may be seen by dissecting them off, and holding them between the eye and the light. In proportion as the morbid action increases, the discoloration becomes more conspicuous, and the glands are slightly elevated above the level of the adjacent surface, in the form of elliptical, oval, or circular patches, from a few lines to several inches in diameter. At a somewhat later period these bodies exhibit an uneven, granular, mammillated, or honeycomb-like appearance, evidently from the projection of their follicles, and their edges, which are hard, everted, and knobby, overlap their base. They are remarkably plump and full; their thickness varies from one to two lines; and their own substance, as well as that by which they are connected to the muscular coat, is more or less softened, infiltrated, and friable. These changes may involve several glands, a single one, or a great number, and they are always more strongly marked the nearer we approach the ileocæcal valve.

The tumefaction and enlargement of the glands are owing to an exudation in them and in the submucous tissue of a friable substance of a faint red color. This deposit, examined by the aid of the microscope, presents granular matter, crystals of cholesterine, nuclei, and cells, some nucleated, some non-nucleated, of varying shape and size. Wedl[1] has met with instances in which the "typhous" exudation bore a close resemblance to encephaloid, whilst in other cases, again, it was filled with irregular, triangular granular cells, such as are seen in tubercular matter, from which it cannot be distinguished.

When the disease has reached the height above described, its tendency is to terminate in ulceration. At what period this sets in is undetermined. The probability is that it varies considerably in different cases, beginning pretty early in some, tolerably late in others. It is seldom found, except in a very slight degree, prior to the fifteenth day. The process frequently commences simultaneously at several points, from which it spreads in different directions, until the whole or the greater portion of the gland is destroyed by it. Its rapidity is influenced by the severity of the attendant action, by the state of the system, and by various other circumstances, with the nature of which we are unacquainted. The resultant ulcers are of an elliptical, oval, or rounded shape, with hard, smooth, perpendicular edges, as if the patches had been scooped out with a punch. This, however, is not always the case, not even in the same subject. On the contrary, the margins are sometimes quite irregular, jagged, shreddy, knobby, bevelled off, or even partially undermined. The bottom of the sore is gray, ash-colored, pale red, or yellowish, and often covered with the debris of the gland, with lymph, or with lymph and fecal matter. It may be formed by the submucous cellular tissue, by the muscular fibres, or even the peritoneal covering, according to its depth or extent. The largest ulcers are always at, near to, or within a few inches of the ileo cæcal valve. In number they range from four or five to twelve or fifteen. In the early stage of the disease there may not be more than one or two, while at a more advanced period there may be as many as twenty, thirty, thirty-five, or forty. Ordinarily we find well-marked ulcers at one part, imperfect erosions at another, tumefied and reddened glands at a third, and perhaps an entire freedom from disease at a fourth. It may be stated, as a general rule, that the higher we ascend in the bowel, or the further we pass from the ileo-cæcal valve, the less affected will be the agminated glands, and the mucous membrane between them. Fig. 185, from a preparation in my collection, shows the ravages, at this advanced stage, of the disease, and the enlarged condition of the mesenteric ganglions.

Fig. 185.



Ulceration of the glands of Peyer, with enlargement of the mesenteric ganglions. From a specimen in my cabinet.

These ulcers may heal, or they

---

[1] Pathological Histology, p. 334, Syd. Soc. ed.

may, on the other hand, erode the peritoneal covering, and so lead to perforation. This, however, is very uncommon; but when it does occur it is always rapidly fatal. The perforation is generally single, from two to three lines in diameter, irregularly rounded, and near the ileo-cæcal valve. It is most frequent in the milder grades of the disease, and commonly takes place during convalescence, or when the patient is considered as out of danger.

When death occurs early, before the establishment of ulceration, the submucous cellular tissue of the affected glands is sometimes converted into a hard, friable substance, of the consistence of crude tubercle or solid cheese; it is of a pale pink or yellowish color, destitute of any trace of organization, and exhibits, when cut, a dry, glossy surface. The cause of this transformation is unknown.

The small bowel is moderately distended with air, and usually contains more or less mucus tinged with bile. The doudenum and jejunum are almost constantly healthy. The alterations of the mucous tissues of the ileum, in the intervals between the elliptical patches, are various. In a considerable proportion of cases, the isolated follicles are reddened, softened, and enlarged to three or four times the natural volume. After the second week they are occasionally found ulcerated, œdematous, or infiltrated with soft matter. These changes are always most strongly marked in the lower portion of the tube. The mucous membrane itself is, in a majority of instances, more or less altered in color. In many it is red, not continuously, but in patches or zones; in some it is grayish, and in a few it is unusually pale. Its consistence also varies. It may be perfectly natural, or so slight as to escape attention; more frequently, however, it is diminished, and this may be so considerable as to enable us to scrape off the membrane with the greatest ease, or to convert it into a soft, pulpy substance, not unlike thin currant jelly. The discoloration and loss of cohesion may coexist, or they may occur independently of each other.

In some cases the mucous membrane is the seat of sanguineous infiltration. This condition may exist to the extent only of a few inches or of several feet. It is generally continuous, not in patches or zones. The color of the affected membrane ranges from a rose to a very dark red, and it has a peculiarly brilliant and trembling or quivering appearance, like jelly.

There is hardly a case of typhoid fever that lasts beyond the sixth or eighth day in which the *mesenteric ganglions* are not more or less seriously involved. Whether they are affected simultaneously with the glands of Peyer is not certain. The irritation seems to extend from the mucous membrane along the lymphatic vessels in the same manner as it does along those of the penis in chancre. The affected ganglions are increased in size, of a rosy, red, or purple color, and so soft that they may be readily broken down with the finger. In a few rare cases they contain a soft purulent matter. These changes usually coexist, and accurately correspond with the diseased patches. Those opposite the healthy glands are sometimes enlarged. Immense numbers of these bodies are occasionally involved. The irritation not unfrequently spreads to the meso-colic ganglions, which, however, are seldom affected in the same degree as the mesenteric.

The *spleen* is hardly less frequently or less seriously affected than the glands of Peyer and the mesenteric ganglions. The probability, indeed, is, that it is implicated in nearly every instance at an early stage of the disease. The most constant alteration is an augmentation of its volume, which is often three, four, or even five times the normal standard. It is also very generally diminished in its consistence. The softening varies in degree from slight loss of cohesion to complete pulpiness. These two changes may occur separately, but more frequently they coexist, and are always more strongly marked in proportion to the rapidity of the disease. Along with them are observed various alterations of color, of which the most constant are dark brown, bluish, black, or livid. The changes here described are not limited to particular portions of the spleen, but affect it universally and equally throughout.

The *large intestine* is meteorized and ulcerated. Gas is present in a large proportion of cases, and may be so copious as to produce excessive distension of the abdomen, with corresponding difficulty of breathing. Ulcers exist in one patient out of three. They are small, not numerous, superficial, and most abundant in the cæcum and ascending colon. The villous membrane may be sound throughout, or it may be reddened, thickened, or diminished in consistence. In a small proportion of examples the submucous cellular tissue of the isolated follicles is converted into a hard, curdy, yellowish substance, similar to that spoken of under the head of the elliptical patches.

The *stomach* is free from disease in about one-third of the cases of typhoid fever. In the remainder the mucous membrane is variously affected, being discolored, diminished in consistence, increased in thickness, mammillated, or ulcerated. These changes may exist independently of each other, or, as more commonly happens, two or more may occur together.

The *pharynx* and œsophagus are not often affected. The only lesion to which they appear to be at all subject in this disease is ulceration, which occurs in about one-fifth of the cases. The erosions are usually very superficial, of a circular or oval shape, and from one to six lines in diameter.

The *liver* does not seem to be oftener affected in this than in other acute diseases. It may be unnaturally pale, or it may be dark, reddish, or engorged with blood. The bile is very abundant, fluid, reddish, or greenish. The gall-bladder, in a few rare cases, contains pus, and its mucous membrane is sometimes manifestly inflamed. The pancreas, salivary glands, urinary apparatus, and genital organs are usually healthy.

The *lungs* are natural in about one-fourth of the cases. The most constant alteration is a carnified state of the parenchymatous substance, which is tough, leathery, and of a dark red or livid color; it is destitute of air, readily sinks in water, and is with difficulty broken down with the finger. "When cut, the smooth surface is directly covered with a thick, red fluid. This peculiar lesion almost always occupies a circumscribed portion of the lower and posterior lobe of one or both lungs. It is quite unlike, in almost every respect, the second stage of inflammation, although the term hepatization has sometimes been applied to it."[1] Some pathologists regard this dense state of the lung as due to a particular typhous deposit. The mucous lining of the bronchial tubes is often unnaturally red: the trachea and larynx are sound, but the epiglottis is sometimes ulcerated or denuded: the pleural cavity, in many cases, contains bloody serum, varying in quantity from a few ounces to a pint or more, and occupying both sides of the chest.

The *heart* is natural in about half the cases. The principal change which it experiences is a loss of consistence, which is sometimes so great that the muscular tissue may be readily torn and broken down. Conjoined with this there is generally a departure from the natural color, which is either pale, deep red, violet, or livid. The lining membrane of the aorta is frequently found reddened, probably from the imbibition of hæmatosine. The blood drawn during life rarely exhibits the buffy coat; it coagulates imperfectly, and there is always a considerable diminution in the natural proportion of fibrin. When the buffy coat is present, it is unusually thin, of a soft, jelly-like consistence, and of a grayish or greenish color. The blood in the cavities of the heart may, as, indeed, it frequently is, be black and fluid, or it may be clotted or grumous. Occasionally it is converted into fibrinous concretions. When fluid, it may contain bubbles of air.

The *brain* is more rarely implicated than the severity of the symptoms might lead us to infer. The medullary substance is moderately injected in a majority of cases, and the cortical is often more or less red. The pia mater may be uncommonly vascular, and the subarachnoid cellular tissue is frequently œdematous, or infiltrated with serosity. The ventricles and the serous sac on the surface of the brain occasionally contain a few drachms of clear, or slightly turbid, water.

3. *Infantile Cholera.*[2]—Much attention has been directed of late years to the pathological anatomy of infantile cholera, a disease of great prevalence in the United States during the hot spring and summer months, and a cause of no little mortality. From the statistical tables of Dr. Emerson, it appears that in a period of twenty years, extending from 1807 to 1827, there were 3,576 deaths from this disease alone in this city, an enormous number, considering the comparatively small population at that time. Children are most liable to suffer during the second summer, and in some districts very few escape the disease. From the dissections which I made during my residence in Cincinnati, where the disease is unusually common and severe, I am authorized to conclude that the affection consists essentially in follicular inflammation of the alimentary canal, often followed by softening and ulceration, especially in the more chronic forms of the attack. The period

---

[1] Bartlett's History, Diagnosis, and Treatment of Typhoid and of Typhus Fever, p. 51. Phila., 1842.

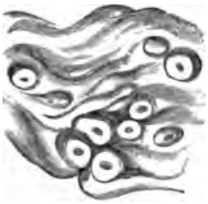
[2] It is difficult, in a work of this kind, to give this disease a proper location. I place its pathological history here merely for the sake of convenience. Perhaps it would have been better if I had described it in connection with the large bowel.

at which it proves fatal varies from less than twenty-four hours to several months. Hence, there must necessarily be much diversity in regard to the pathological appearances.

In one of my cases, death occurred in less than fifteen hours from the time the child, who was twenty months old, was seized with vomiting and purging, although it had been laboring under slight diarrhœa for nearly a week. The stomach and duodenum were healthy. The glands of Peyer and the isolated follicles of the ileum were unusually large and distinct, but not otherwise affected. The follicles of the rectum were also enlarged; and the mucous membrane of the colon, from the ileo-cæcal valve down, was softened and more or less injected, its surface being of a faint rose hue. The mesenteric ganglions were enlarged and pale. The spleen, liver, and gall-bladder were sound.

When the disease does not prove fatal under a week or ten days, the pathological appearances are usually more distinctly marked. The principal lesions will be found to exist in the isolated follicles of the lower portion of the ileum and of the large bowel. They are in general unusually large and distinct, projecting considerably beyond the surrounding level, so as to impart to the surface of the membrane a rough tuberculated appearance, as if it were inlaid with small mustard-seeds. They are set closely together, and are of a pale whitish color, their base being sometimes encircled by a minute vessel, and their orifice being often quite patulous. These appearances are well illustrated in the accompanying sketch (Fig. 186), from a specimen in my cabinet. Occasionally, instead of being hard, these little bodies are very soft, or so fragile that they may be readily picked out of the mucous corion. The intervening mucous membrane is usually somewhat softened, and occasionally, especially in cases of considerable standing, so much so that it may be easily scraped off, and converted into a reddish pulpy substance. Indeed, I look upon a loss of cohesion of the mucous membrane as one of the most prominent lesions of this disease. It is always most conspicuous in the colon, which it sometimes affects from one extremity to the other, extending occasionally low down into the rectum. In the ileum it is also sometimes present, but is never very extensive, except in protracted cases, when it may reach high up towards the jejunum. Conjoined with this change there is usually more or less thickening of the mucous membrane, which is also most distinct in the large bowel, and occurs either in large patches or continuously over the greater portion of the tube. The glands of Peyer, especially those near the ileo-cæcal valve, are often considerably softened, abnormally prominent, and even slightly discolored, though the latter occurrence is rare.

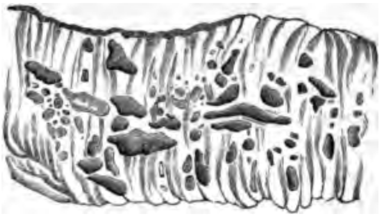
Fig. 186.



Enlargement of the mucous follicles of the large bowel.

In chronic cases, besides the lesions here mentioned, I have frequently found ulcerations of the mucous membrane, particularly of the large bowel. They varied much in shape, size, and number. In general, however, they were circular or oval, and from the size of a pin's head to that of a small currant, with steep edges, not ragged or undermined, except where a follicle seemed to be lifted bodily out of its place by the morbid action. Sometimes the ulcers ran into each other, and were then very irregular in their shape. Their number was occasionally very great, hundreds upon hundreds being scattered over the affected surface. In depth they seldom extended beyond the submucous cellular tissue. The annexed cut (Fig. 187) conveys an excellent idea of the form and size of these ulcers. It was taken from a specimen in my collection, the patient having died nearly three months after he had been seized with the disease. Numerous follicles, more or less enlarged, are seen around the ulcers.

Fig. 187.



Follicular ulceration of the large bowel. From a preparation in my cabinet.

The mesenteric ganglions are variously affected. In recent cases they are, in general, merely somewhat enlarged and softened, with a slight increase of vascularity; but, under opposite circumstances, they are nearly always very tumid, and remarkable for their loss of cohesion, though they are rarely much discolored. The pelvic ganglions, especially the meso-rectal, often suffer in the same manner, particularly when there is considerable softening, or softening with ulceration.

The duodenum and jejunum are, so far as my observation extends, always free from disease. The gall-bladder usually contains a small quantity of greenish or yellowish bile, and a little of the same fluid is not unfrequently found in the upper portion of the alimentary tube. The liver I have nearly always found natural, and the same is true of the spleen, pancreas, kidneys, urinary bladder, and thoracic viscera.

The stomach may be perfectly healthy, or it may exhibit evidence of being diseased. When the affection runs its course very rapidly, I have found it entirely free from all morbid appearances, even when there was much vomiting. In chronic cholera, however, it is not uncommon to meet with softening of the mucous membrane, particularly along the great cul-de-sac of the organ, with enlargement of the muciparous glands, which sometimes stand out in bold relief, forming little, whitish, grain-like projections upon the free surface of the stomach. Ulceration is a rare occurrence. Sometimes small reddish patches are observed, looking as if they had borne the principal burden of the morbid action. Softening of the mucous membrane often coexists with thickening.

In protracted cases, aphthæ generally make their appearance, but seldom until great exhaustion has set in. They cover the tongue, fauces, and roof of the mouth; and in some cases I have seen them on the lips, in the œsophagus, and on the vulva.

The brain and its membranes are frequently involved; the most common pathological changes being softening of the former, and serous effusions in the latter. Emaciation often proceeds with astonishing rapidity; in the chronic form of the disease it is generally excessive.

4. *Hypertrophy.*—This affection of the small bowel is generally the result of chronic irritation, leading to an effusion of lymph into the connecting cellular substance. The tunics may be from three to six lines in thickness, and of almost fibrous hardness. The part of the small bowel most subject to hypertrophy is the lower end of the ileum, where it commonly occurs in particular spots. The affection is often attended with stricture, sometimes carried to such a degree as almost to close the natural passage. In these cases, the gut above the seat of the contraction is frequently enlarged to three or four times the ordinary capacity.

5. *Atrophy.*—This state is most commonly witnessed in chronic disease of the alimentary tube, as an effect of inflammation. The best characterized examples of it that have fallen under my observation have occurred in persons that have died of peritonitis, consequent upon parturition and Asiatic cholera, and attended with copious deposits of lymph. This substance, by compressing and constricting the bowels, has the effect of contracting them, both in length and breadth, and thus greatly diminishing their normal volume. I have seen cases where, in consequence of these morbid adhesions, the intestinal tube of the adult was hardly eight feet in length by half an inch in diameter, its different tunics being at the same time greatly indurated, and so metamorphosed in their structure as to render them difficult of recognization. In some instances, again, the walls of the bowels are excessively attenuated, the muscular fibres are pallid and widely separated, and the mucous membrane is reduced to a thin, semi-translucent, bladder-like layer.

6. *Contraction and Dilatation.*—Atrophy of the intestines is generally, though not necessarily, associated with a diminution of their caliber. This is more particularly the case when the lesion is caused by the pressure of effused lymph or of various morbid growths. Sometimes, instead of being reduced in diameter, they are enormously dilated. Cases are upon record in which the whole tube, from one end nearly to the other, was converted into an immense cylinder, measuring upwards of a foot in circumference. Such extreme cases are usually connected with, or dependent upon, some permanent obstacle to the evacuation of the feces, as stricture, cancerous formations, or alvine concretions.

7. *Tubercle.*—Conjoined with ulcers of the small intestine, or occurring without them, are occasionally to be observed small tubercles, seated either in the submucous cellular tissue, amongst the muscular fibres, or between them and the peritoneal covering, or, more rarely, in the mucous membrane. Varying in size from a mustard-seed to a small pea, they are often equally dispersed over the circumference of the bowel, and are almost always most numerous in the lower half of the ileum.

Tubercles of the small intestines are very frequent in phthisical subjects, occurring in at least three-fifths of the cases. Their softening, which happens at a variable and indefinite period after their deposition, is followed by a corresponding number of ulcers, which, when very numerous, sometimes run together, and thus give the mucous membrane a riddled, cribriform aspect. The edges of the ulcers are rounded and indurated, their base being formed by the submucous cellular tissue. When they run together, the large ulcer thus formed has a raised, but less regular margin, and is infiltrated with a rather soft material. Occasionally the erosion presents itself in the form of a narrow, circular figure, with a portion of tubercular substance in its centre. Ulcers of this kind are susceptible of cicatrization.

Tubercles of the intestines are not peculiar to the human subject. I have noticed them in different classes of quadrupeds, particularly in the horse, ox, and sheep, in the latter of which they are exceedingly common, especially in the Western States. The number of tubercles in this animal is sometimes immense: they occur throughout the whole length and breadth of the intestinal tube, and, as in the human subject, most of them are situated in the submucous cellular tissue. Their volume varies between a millet-seed and a pea; but, by their agglomeration, they often form large nodules, which are particularly conspicuous along the line of attachment of the mesentery and meso-colon. In their color, these bodies are usually of a greenish gray; while, in their consistence, they range between soft putty and fibro-cartilage, cartilage, and even bone.

In making examinations, opportunities occasionally occur of observing different morbid growths in the small intestine. Amongst these, the most important are polypous and fungous tumors; none of which, however, as they do not differ materially from such as occur in the stomach, need here be particularly described. They are all extremely rare.

8. *Carcinoma.*—Cancer of the small intestine is infrequent, especially the scirrhous variety, of which I have never seen an instance. Colloid and encephaloid are also very uncommon. The latter growth occasionally occurs in the form of a solitary tumor, or of little pedunculated excrescences, hardly as large as an almond, and occupied either by blood or by a soft, brain-like substance.

9. *Melanosis.*—This substance is occasionally observed in the alimentary tube. Its most common seat is in the small bowel, but it may occur indiscriminately throughout the whole intestinal tract. The quantity deposited is various; in general, however, it is very trifling. The black matter assumes different shapes, occurring either in thin, stratified patches, or in the form of small, flat, rounded tumors, some of which are occasionally encysted. It usually collects in the cellular tissue between the peritoneal and muscular tunics; sometimes it is found upon the free surface of the bowel, and instances occur where it is seated in the submucous texture.

Small, brownish, mahogany, or slate-colored stains are sometimes met with in the villous and follicular structures of the intestines, produced either by a stagnation of the blood, or by this fluid having been subjected to the action of some acid. They are often seen in cases of chronic irritation, and are particularly conspicuous in the glands of Brunner and of Peyer, the former of which are occasionally completely encircled by them. These stains are liable to be confounded with those resulting from melanotic infiltration, but may be easily distinguished from them by the fact that they do not, like the latter, soil the finger when washed in clear water.

10. *Concretions.*—Earthy concretions sometimes form in the bowels, but much less frequently in the human subject than in some of the inferior animals. Their size is extremely various. Sometimes they do not exceed a garden pea; at other times, however, they are as large as an orange; and a case is mentioned where a body of this kind, taken from the colon of a woman, weighed four pounds. In the inferior animals, their bulk is occasionally enormous.

Although there are seldom more than two of these concretions, yet in some cases they are quite numerous, as many as ten or fifteen being found in one person. They are generally of a globular shape, except when they are multiple, when they are apt to be a little flattened, probably, from the friction which they exert upon each other. They are of a brownish color, and of a porous, spongy appearance, being composed of an immense number of small fibres, which are intimately interwoven with each other like the felt of a beaver hat, the intervals between them being filled up by earthy matter. In most cases, these fibres are arranged in distinct lamellæ, the external of which are several lines in thickness, and are generally of a lighter color than the internal. Each concretion is commonly provided with a central nucleus. Their chemical constituents are albumen, common salt, phosphate of lime, and phosphate of soda.

Alvine concretions are most frequent in Scotland, where they owe their origin to the oats so much employed by the lower orders as an article of food. But almost any extraneous and indigestible substance may serve as a nucleus to them, as fragments of almonds, nut-kernels, grape and cherry-stones, pieces of radishes, and even tea-leaves. Occasionally they are caused by the long-continued use of magnesia.

Other concretions are sometimes found in the intestinal tube, very different from those just described. They are mostly observed in dyspeptic subjects, or in those who suffer habitually from a torpid state of the bowels and derangement of the assimilative functions. What their precise constitution is has not been ascertained, nor do we know anything satisfactory respecting the nature of their origin or the mode of their development. They are, in some instances, of an irregular shape, of the consistence of inspissated tallow, slightly translucent, and of a grayish drab color; in others, they are of a globular form, nearly or quite opaque, of an adipocirous or waxy character, and of a pale yellowish, whitish, or cineritious hue. In size they vary between a small pea and a large grape; and they rarely, if ever, have any proper nucleus, though they are often much harder at the centre than at the circumference.

11. *Fatty Discharges.*—Evacuations of fatty matter from the bowels have been noticed almost from time immemorial, but it has only been within the last fifteen years that they have attracted much attention. The form in which the matter exhibits itself is extremely various. Sometimes it has, apparently, all the properties of oil, being perfectly

liquid, specifically lighter than water, and of an inflammable nature; at other times, it is semi-concrete, or of the consistence of tar, thick treacle, or jelly, and of a pale straw color. Very frequently, it comes away quite fluid, but acquires an immediate increase of consistence on exposure to the atmosphere. The quantity evacuated is also liable to considerable diversity. In the case of a young man which fell under my observation a few years ago, it amounted to from three to six ounces in the twenty-four hours for nearly a month. The matter was, at times, excessively fetid, and resembled, both in color and consistence, paste made of wheat flour. In one instance a patient ejected in a short time, not less than thirty pounds. Instead of being offensive, the discharge is sometimes entirely free from smell, and capable of protracted preservation. No extended analysis has yet been made of this substance; nor can it be stated with any positive certainty whence it is derived. From the fact that it has been repeatedly witnessed in persons laboring under disease of the liver or pancreas, it has been supposed to be owing to that circumstance, but this may have been a mere coincidence; at all events, we are in possession of proof to show that cases occur in which no lesion of these organs is found on post-mortem examination. The discharge is occasionally associated with pulmonary phthisis, hysteria, and diabetes, and has been known to proceed simultaneously from the bowels and urinary bladder.

12. *Laceration.*—The subject of laceration of the bowel from external violence, is one of no little interest in a medico-legal point of view, apart from any pathological consideration. All the membranous viscera are liable to this occurrence, though not in an equal degree. It is usually produced by kicks or blows, and, as it is always followed by extravasation of the contents of the affected organ, it speedily terminates existence. It is a remarkable fact, and one for which we cannot offer any satisfactory explanation, that most of the cases of this accident of which we have any record, affected the jejunum, or the superior portion of the ileum. Another circumstance worthy of notice is, that the bowel may be very much lacerated by external violence without any discoloration or contusion of the surface of the abdomen. I add the following cases in further illustration of the subject:—

A coachman, twenty-two years of age, received a kick from a horse, upon the left side of the abdomen, between the diaphragm and the crest of the ileum, of which he died in thirty hours. There was no sign of contusion on the skin; but, on dissecting up the integuments, Professor Drake[1] found an extravasation of blood between the oblique muscles, near the junction of their fleshy and aponeurotic parts, which at once indicated the spot where the blow had been inflicted. A large quantity of gas escaped from the abdominal cavity, which, moreover, contained upwards of two quarts of fluid feculent matter, of a turbid yellowish color, without any admixture of blood. The peritoneum was universally inflamed; the bowels were closely agglutinated to each other and to the surrounding parts; and in the upper portion of the jejunum, about eighteen inches from the duodenum, were two rents, with thickened, ragged, and everted edges, one of which extended one-third, the other nearly entirely, across the tube. The mucous membrane was but little inflamed. The cellular substance over the second and third lumbar vertebræ was infiltrated with blood, and the left psoas muscle had a swollen and lacerated appearance.

---

[1] Western Journal of the Medical and Physical Sciences, vol i. p. 550.

In another case, that of a young man of twenty, the injury was occasioned by the blow of a brick thrown from a short distance. Death occurred in forty-two hours. No mark of external violence was discoverable either on the skin or in the abdominal muscles. On dissection, the late Dr. Joshua Martin, of Xenia, to whom I am indebted for a history of the case, as well as for the specimen, detected, in the superior division of the ileum, an oval aperture, about three-quarters of an inch in diameter, through which had escaped a large quantity of fecal matter, giving rise to violent and extensive peritonitis. The bowels were everywhere incrusted with lymph, which also adhered to the everted margins of the wound, as well as to the mucous membrane immediately around.

The following case fell under my own observation: A gentleman, sixty-one years of age, while riding in a gig out of a livery stable, came in collision with a wagon, by which his vehicle was upset, and he himself thrown with considerable force upon the ground. What particular part of his body struck could not be ascertained. He was able to walk immediately afterwards, and did not appear to be much hurt. In a few minutes, however, he was seized with violent pain in the umbilical region, which gradually extended to the chest, and continued, without intermission, until he expired, thirty-six hours from the accident. The other prominent symptoms were, pallor of the countenance, a small and frequent pulse, urgent thirst, constipation of the bowels, and, towards the last, occasional vomiting of bilious matter. There was no restlessness, and only slight tympanitis.

On opening the abdomen, the subcutaneous cellular tissue of which was loaded with a thick layer of fat, a small quantity of fetid gas escaped. About a pint of serous, feculent fluid was contained in the right hypochondriac region among the folds of the intestinal convolutions, which were extensively adherent, and, together with the parietal portion of the peritoneum, everywhere in a state of intense inflammation. The omentum, which was prolonged, on the right side, into an old hernial sac, was throughout of a reddish purple color. In the ileum, two feet and a half from the ileo-cæcal valve, was an opening, with irregular but not ragged edges, horizontal, and scarcely as large as a goose-quill, which had permitted the escape of the fecal matter, and at once explained the cause of the fatal mischief. The mucous membrane was not everted, and the margins of the aperture had already contracted adhesions to the surrounding parts. The coats, both of the small and large bowel, were perfectly healthy. The quantity of fecal matter was not unusual. Not the slightest abrasion, contusion, or discoloration was observable upon the skin of the abdomen.

In all these cases, as well as in every other of which I have any knowledge, the symptoms which supervened upon the injury were of the most urgent kind, being such, precisely, as accompany perforation of the bowel from ulcerative action; that is, rapidly developed, and speedily fatal, peritonitis.

13. *Internal Strangulation.*—Internal strangulation of the intestines may take place in different ways, and under a great variety of circumstances. A knowledge of this fact suggests the propriety of arranging it under the following heads: 1, strangulation from the development of a membranous band, from the attachment of one portion of the bowel to another or to an adjoining organ, or from unnatural adhesions of the free extremity of the vermiform appendage, omentum, or Fallopian tube: 2, from the rotation of the canal on its own axis, or round an axis formed by the mesentery: 3, from one portion of the bowel compressing another: 4, from the intestine slipping into an abnormal aperture in the omentum, mesentery, or mesocolon: 5, from the pressure exerted on the canal by a tumor, an enlarged ovary, or a diseased uterus: 6, from one piece of bowel falling within another, constituting what is called intussusception. This classification comprises all the forms of internal strangulation of which I have any knowledge.

I. The first species of strangulation is the most frequent of all, and may be produced by the formation of a membranous band, the vermiform appendage, a process of the omentum, a diverticulum of the ileum, or the Fallopian tube.

*a.* The formation of membranous bands is exceedingly common, and numerous cases of internal strangulation from this cause are upon record. There may be several such bands, but the constriction is usually produced by a single one, varying in length from six or eight lines to two, three, or even four inches. It is often of unequal size, and sometimes scarcely as thick as a pack-thread. It may be perfectly smooth, transparent, and ribbon-shaped, or rough, opaque, and rounded like a cord. In its consistence it varies from that of recently organized lymph, out of which it is formed, to that of cellular substance, serous membrane, or fibrous tissue. Its extremities, which may be bifid, or divided into several processes, observe no regularity in regard to their points of attachment. Both may be inserted into the mesentery, or one into the mesentery and the other into the bowel; sometimes they are connected with two coils of intestine, and occasionally, again, though more rarely, they extend from the surface of the alimentary tube to an adjoining organ, or to the wall of the abdomen. Dupuytren met with a case where both extremities of the membranous band were attached to the wall of the abdomen, just above the inguinal ring, forming an aperture which was traversed by a portion of the intestinal canal.

This variety of strangulation is most common in old subjects, but may take place at any period of life. Dr. Paramore, of Ohio, communicated to me, a few years ago, the particulars of a case of this kind, which occurred in his own child, a boy twenty-one months old. It lasted three days, and was marked chiefly by irritability of the stomach, with obstinate constipation and pain in the abdomen, but no tenderness on pressure. A band of false membrane, about one inch and a half long, extended over two coils of the ileum, which were thus firmly constricted and deprived of their vitality. Its extremities were attached to the mesentery, opposite the lumbar vertebræ.

*b.* The vermiform appendage, by contracting adhesions with the surrounding parts, may become a source of strangulation. The attachment may take place to a loop of the small intestine, the sigmoid flexure of the colon, omentum, mesentery, rectum, urinary bladder, the uterus, ovary, or wall of the abdomen. The appendage may retain its natural appearance, or it may be flattened, diminished in size, and transformed into a solid ligamentous cord. A very interesting case, in which the cæcal appendix was attached to the uterus, came before me, some years ago, in a young married female, twenty-two years of age. Up to the period of her confinement she had enjoyed excellent health; but, twelve days after this occurrence, she was seized with severe peritonitis, attended with excessive irritability of the stomach, and the most obstinate constipation of the bowels. These symptoms persisted, without any decided abatement, until the ninth day from the attack, when she died in a state of complete exhaustion. On dissection the serous membrane of the abdomen was found to be extensively inflamed; there was a copious deposit of lymph upon the pelvic viscera; and the vermiform appendage, the extremity of which was firmly agglutinated to the side of the uterus, passed over a loop of the ileum, and thus effectually intercepted its contents.

*c.* In the third form of this species of strangulation the mischief is caused by a diverticulum of the alimentary tube. The preternatural process, which—as will be seen further on—is usually connected with the lower portion of the ileum, to which it forms a sort of appendage, from two to six inches in length, terminating in a cul-de-sac, like the finger of a glove. It is composed of the same number of coats as the canal from which it arises, but is generally somewhat narrower. In the natural state it is free, and floating, like the rest of the alimentary canal; but it is liable, from disease of its peritoneal covering, to form attachments to the surrounding organs, and may thus become a cause of internal strangulation, in the same manner as a fibrous band, the vermiform appendage, a process of omentum, or the Fallopian tube. Moscati[1] relates the case of a man, thirty-three years of age, whose death was occasioned by a diverticulum five inches long, funnel-shaped at its commencement, and terminating in a narrow ligamentous cord, which passed twice around the ileum, and then connected itself with the mesentery.

*d.* A number of examples of strangulation of the bowel from morbid adhesions of the omentum are on record. The omentum may be unnaturally elongated, or its free extremity may be divided into a number of narrow-pointed slips. In either case, it may contract adhesions with the surrounding parts, as the uterus, urinary bladder, ovary, mesentery, spine, or wall of the abdomen; and thus afford a barrier, on some occasions, to the course of the feces, followed by distension, inflammation, and strangulation of the bowel. In two cases related by Monro the intestinal canal was constricted at three different points by as many band-like processes of the omentum. Albert[1] gives an instance where the small bowel was strangulated by a slip of mesentery.

---

[1] Mém. de l'Acad. Royale de Chir., t. iii. p. 427. Paris, 1819.

*e.* Leblanc[2] has recorded a case of intestinal strangulation produced by the peduncle of a fatty tumor, developed in the cellular tissue of the mesentery of a mare. The peduncle was of an elongated shape, and, after completely surrounding the bowel, was inserted into the left side of the mesentery. The animal died after having suffered for fifteen hours with violent colic.

*f.* In the case of a child, three years old, described by Howship,[3] death was caused by a crescentic fold of the peritoneum, stretched across the upper brim of the pelvis, so as to compress the rectum, which passed down behind, between it and the sacrum.

*g.* Rostan observed a case where the right ovary was attached to the rectum, with which and the sacrum it formed a sort of sac, in which a piece of the intestine lay strangulated. In an old woman, examined by Gautric,[4] the left ovary had contracted adhesions by its external extremity to the lateral surface of the bladder, thus forming a species of arch under which a portion of the ileum, about two feet in length, was engaged and strangulated.

*h.* The strangulation may be caused by the Fallopian tube. This occurrence is of course exceedingly rare, and the only instance of it on record, so far as I am aware, is that mentioned by Dorilas, in "Der Beobachtungen für Wundärzte," Leipsic, 1783.[5]

*i.* By simple adhesions between one portion of bowel and another, or between a portion of bowel and an adjoining organ. To this division belong those cases of strangulated hernia, in which the stricture, formed by membranous bands, remains after the parts have been replaced into the abdomen.

*j.* Lastly, it seems probable that a vessel of the mesentery or omentum may prove a cause of derangement of the functions of the alimentary canal. Monro mentions a case in which, besides the constriction produced by the omentum, the intestine was surrounded and strangulated by a vessel from the mesentery, not larger than a small goose-quill.

II. The second species consists of those cases in which the bowel is rotated round its own axis, or round an axis formed by the mesentery. It is most common in the small bowel, but may also occur in the large, especially in the sigmoid flexure. Old persons are most subject to it, and its formation is favored by the presence of hernial tumors, or other accidental products, which alter the position and attachment of the abdominal viscera.

III. In the third species the narrowing, constriction, or obliteration is produced by the pressure of the mesentery, or of one portion of bowel upon another, the suffering part of the tube being generally interposed between the compressing part and the posterior wall of the abdomen. It appears to occur most frequently in persons considerably advanced in life, the tendency to its formation being favored by the great length and laxity of the mesentery, by fecal accumulation in the alimentary canal, by large, old hernia, and by adhesions of the convolutions of the intestines to each other and to the mesentery. The lesion is usually slow in its progress, and is most common in the large bowel, for the obvious reason that this is the more fixed and immovable portion of the tube.

---

[1] Jurisprud. Medic., t. iii. p. 645.

[2] L'Examinateur Médicale, Juillet 11, 1841.

[3] Practical Remarks on the Discrimination and Appearances of Surgical Disease, p. 255. London, 1840.

[4] Bulletin de l'Académie Royale de Médecine, Mars 31, 1841.

[5] Voigtel, Op. cit., ii. p. 567.

The compression of one portion of bowel by another is rare. One of the most remarkable instances of this kind is that recorded by Gendrin,[1] of a child six months old, who had labored from birth under habitual constipation and vomiting. The arch of the colon was situated between the spine and the duodenum, which confined it like a ligament.

IV. The fourth species is that form of the affection in which the bowel slips into an opening of the mesentery, omentum, or mesocolon. The aperture may be the result of malformation, of external violence, or of interstitial absorption from long-continued pressure. In its diameter it varies from a few lines to several inches, and in its form it is either circular, oval, or slit-like, with sharp and well defined margins. There is seldom more than one such opening, but there may be two or three. When a portion of intestine insinuates itself into an aperture of this description it either becomes strangulated, or it gradually effects the separation of the contiguous layers of the affected part, and ultimately forms a large bag, capable of lodging the whole of the small intestine.

The intestine may enter the foramen of Winslow, pass into the posterior cavity of the epiploon, and, perforating the transverse mesocolon, there become strangulated. Of this occurrence a case is mentioned by Blandin, in his *Surgical Anatomy*, and another by Jobert, in his *Traité des Maladies Chirurgicales du Canal Intestinal.*

V. In the fifth place the intestinal canal may be strangulated by the pressure of a tumor, situated either in the abdominal cavity, in the coats of the bowel, or in the interior of the tube. This form of the disease is of very frequent occurrence, is generally of slow formation, and is much more common in the old than in the young or middle-aged.

*a.* The most frequent cause of this species of strangulation is the existence of organic disease in the coats of the alimentary tube. This is generally of a carcinomatous nature, and the parts more particularly obnoxious to it are the rectum, the sigmoid flexure, the ascending colon, and the ileo cæcal valve. As the malady progresses, the canal at the seat of the disorganization gradually diminishes in size, until at length the passage of the fecal matter is completely arrested, and the patient dies with all the symptoms of strangulation from ordinary causes.

---

[1] Archives de Médecine, t. viii. p. 494; Andral, Path. Anat., vol. ii. p. 92.

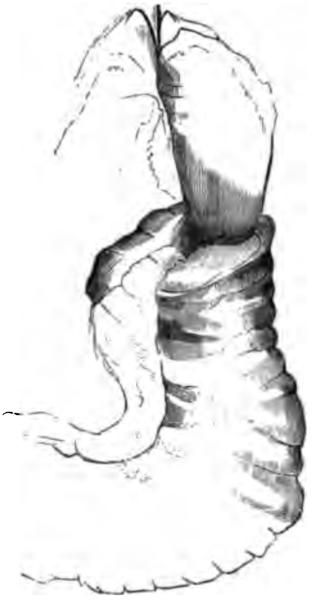
*b.* Tumors are sometimes developed within the canal, and these, by obstructing the course of the feces, may lead to the same result as disease seated among the tunics of the bowel. A polype of the rectum has been known to produce death by arresting the contents of the tube,[1] and similar effects occasionally follow the formation of an intestinal concretion.

*c.* Mr. Howship[2] relates a case in which the strangulation was caused by the pressure of an ovarian tumor upon the rectum, where the latter passes over the brim of the pelvis. The patient was fifty-two years old, and the tumor contained between six and seven pints of serum. The whole of the bowel above the seat of the obstruction was dilated, congested, and filled with fluid matters, as in strangulated hernia.

*d.* It is not improbable that fatal obstruction of the bowel might be produced by a fibrous tumor of the uterus, or by the uterus itself, when much enlarged and partially dislocated, as in retroversion. Similar effects might result from the presence of a morbid growth of the pelvis and from a distended Fallopian tube.

Dr. Hoescher,[3] of Hanover, has published a case of intestinal strangulation produced by hypertrophy of the pancreas. The organ had grown to the size of the head of a four months' fœtus, and had so inclosed the duodenum for about three inches of its length that it would not admit of the passage of a goose-quill.

Fig. 188.



Intussusception of the small bowel. From a preparation in my collection.

VI. The sixth species of internal strangulation is produced by what is termed *intussusception.* This consists in the invagination of one portion of bowel within another, thereby filling up its cavity, and usually dragging along with it a portion of the mesentery. To this variety of internal strangulation belongs the very remarkable case recorded by Martin Solon,[4] in which a coil of intestine was intercepted by getting into a perforation in another coil.

Although there is, generally speaking, only one invagination, yet there may be as many as three or four. Much diversity obtains respecting the length of the included portion (Fig. 188). Most commonly it does not exceed two or three inches; in other cases, however, it may be as much as one or two feet. Dr.

---

[1] Voigtel's Handbuch der Path. Anatomie, B. ii. p. 649.

[2] Op. cit., p. 257.

[3] Hannoversche Annalen, Heft ii. 1840; Brit. and Foreign Med. Rev., xii. p. 538.

[4] Bulletins de la Société Médicale d'Emulation pour 1822.

Abercrombie makes mention of a case, in which the inverted intestine measured thirty-eight inches; and instances are to be found in which nearly the whole of the large bowel, together with a considerable portion of the small, was thus invaginated, the ileo-cæcal valve descending as low as the anus. Sometimes, though very rarely, there is a double intussusception, one inverted portion of intestine slipping within another.

The included portion of bowel may be variously affected, and give rise to the most disastrous results. In children, in whom this lesion is much the most frequent, the invagination is occasionally disentangled, either by the natural energy of the muscular fibres of the intestine, or by the influence exerted upon them by purgative remedies. When the incarceration continues for any length of time, the part usually manifests strong signs of inflammation, and either contracts adhesions to the surrounding gut, or else it dies, and is evacuated. In this way may be discharged large pieces of the alimentary tube, and the patient live for years afterwards, in the enjoyment of perfect health. In the former case, that is, when the bowel remains invaginated, its coats are very apt to become thickened, and to lay the foundation of permanent stricture.

The length of the eliminated part is various. In my private collection is a piece of the colon, twenty-nine inches long, which was presented to me by Professor John Dawson, of Ohio, and passed by a child six years of age, who, notwithstanding, speedily recovered. In thirty-five cases, collected from different sources by Dr. William Thomson,[1] the length of the evacuated pieces varied from six inches to upwards of three feet. They generally involved the entire cylinder of the bowel, and nearly all had a portion of mesentery attached to them. The average duration of the disease was between four and five weeks. In twenty-two of the cases, the eliminated portion appertained to the small bowel, in the other, to the large, or jointly to this and to the former. The cæcum alone was affected only in a single instance, the colon in two, the jejunum in three, the ileum in eleven.

Intussusception may take place in any part of the alimentary canal, but is most common in the ileum, near its insertion into the colon, owing, doubtless, to the great difference of size between these two portions. Another fact deserving of notice is that the invagination does not always occur in the natural direction of the intestine, but sometimes from below upwards; which sufficiently disproves the theory, at one time so much in vogue, that this complaint is always caused by one part of the tube falling within another, simply by its weight. Concerning the proximate cause of this disease very little is known. It may be conjectured that it is in some way or other connected with inequilibrious action of the muscular fibres, by which one portion of bowel, contracting energetically, forces itself within another that is stationary, fixed, or passive.

There is a species of intussusception very different from the one just described, inasmuch as it is entirely unattended by inflammation.

---

[1] Edinburgh Medical and Surgical Journal, October, 1835.

I have repeatedly observed it in young children, as well as in adults; and, so far as I can judge, it appears to occur during the last struggles of life, from some irregularity in the peristaltic movements of the muscular fibres. The invagination in this variety of the lesion is always limited, according to my experience, to the small bowel.

Of the great frequency of this occurrence some idea may be formed when it is stated that, out of three hundred children, opened at the hospital of Le Salpêtrière in Paris, the great majority of them had three or four intussusceptions.[1] No symptom of inflammation or other disease of the alimentary tube attended. The number of invaginations generally varies from two to five or six. In one instance, that of a child, eight years of age, I counted as many as eleven; and Mr. Burns, of Glasgow, on one occasion met with not less than forty-seven. From the fact that this affection usually occurs either just before death, in the act of dying, or within a few moments after dissolution, before the muscular fibres have parted with their irritability, it may be denominated the *cadaveric* variety of intussusception, in contradistinction to the other, which is called the inflammatory.

14. *Hernia.*—Of hernia there are several distinct varieties, both as regards the contents of the tumor and its situation. The most common place of rupture is at the inguinal and crural rings. Cases, however, are often witnessed in which the bowel protrudes at the navel, or some other part of the abdominal wall; and, in a few rare instances, it has been known to pass into the thorax, through an opening in the diaphragm. There is also a species of rupture in which the intestine descends into the scrotum, in consequence of imperfect closure of the inguinal canal. This constitutes what is termed *congenital hernia.* The bowel in this case lies in the vaginal sac, and the manner in which it gets there may be easily explained by reference to what takes place in the descent of the testicle. Until the end of the seventh month of utero-gestation, this organ is situated in the pelvic cavity, immediately beneath the kidney. About this period it begins to advance towards the abdominal canal, along which it passes, until it finally reaches the scrotum, carrying with it a tubular process of peritoneum. As the descent is being completed, the serous sac is gradually obliterated, the communication between it and the abdomen being thus closed. This usually occurs a few weeks before the child attains its maturity. But it is not always that things proceed thus. In many cases the abdomino-scrotal sac remains open through life, and allows the bowel to pass down in contact with the testicle, forming the variety of hernia in question.

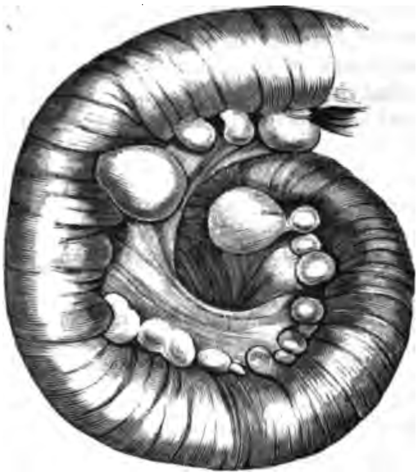
To enter into a minute detail of everything relating to these different varieties of hernial tumors, would be inconsistent with the scope of this work; I shall therefore limit myself to a few remarks respecting the morbid appearances which are usually witnessed in the protruded parts. In the congenital hernia, the mechanism of which has just been described, the intestine generally retains its natural characters, with the surrounding sac scarcely at all altered; and hence, when the patient assumes the recumbent posture, it always has a tendency to glide back into the cavity of the abdomen, descending again when he rises. In chronic cases, however, although the protruded parts themselves may not be particularly affected, the sac, in consequence of the constant pressure that is exerted upon it, is apt to become indurated and thickened, from the deposition of lymph. Shreds of the same substance occasionally adhere to the inclosed bowel, and, by gluing it fast, prevent its return into the abdomen. Similar appearances are sometimes witnessed in the other varieties of long-standing ruptures. In such cases, the sac is often as much as the eighth of an inch in thickness, and evidently consists of a number of well organized layers. The shape of the bag is either oval, rounded, or, more usually, pyriform, the narrower part being above, the broader below. The neck is sometimes quite long, and so narrow as to allow only a small fold of intestine to pass out at a time. The outer surface of the sac is rough and irregular; the internal smooth, polished, and slightly lubricated by serosity. Such are the ordinary appearances to be observed in old and congenital ruptures.

---

[1] Dunglison's Commentaries on Diseases of the Stomach and Bowels of Children.—Amer. Med. Record., vol. viii. p. 139.

In recent ruptures, the sac is generally thin and opaque, differing very little from healthy peritoneum. When strangulation occurs, a new state of things supervenes. For not only does the sac evince signs of inflammation, but the protruded part, whether it be bowel or omentum, is so excessively irritated that it frequently mortifies, whilst the patient either dies, or is doomed to drag out a wretched existence with an artificial anus.

Fig. 189.

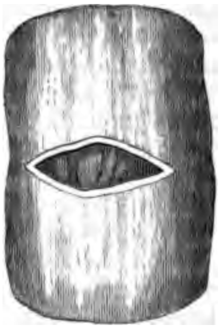


Sacs of the bowel.

15. *Abnormal Pouches.*—Sac like tumors, cysts, or pouches are sometimes found in the bowel, caused by protrusion of the mucous and cellular tunics across the muscular fibres, in the same manner as pouches are occasionally formed in the urinary bladder. Situated chiefly along the mesenteric border of the intestine, they are of a rounded, spherical shape, and vary from the size of a pea to that of a walnut. Some of the larger sacs are occasionally pyriform, or pediculated. Their number ranges from one to several dozens. Their contents are usually of a gaseous character, since their orifice of communication is rarely large enough to admit of the passage of fecal matter.

These sacs may form in almost any portion of the intestinal tube. Professor J. B. S. Jackson, of Boston, informs me that he has met with them most frequently in the large bowel, in aged and corpulent persons. Their development seems to depend upon some mechanical obstacle to the passage of the fecal matter, by which the muscular fibres are separated from each other so as to permit the mucous and submucous membranes to protrude through the resulting intervals. The accompanying sketch (189), affords a good idea of the nature of this affection.

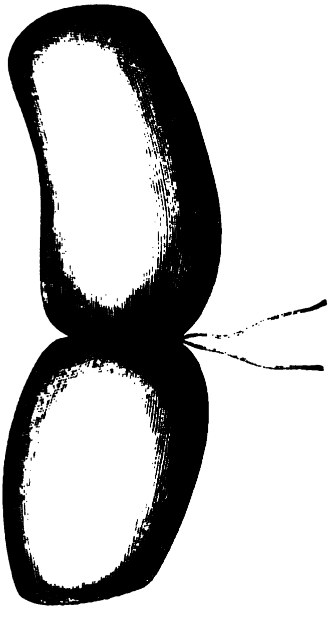
Fig. 190.



16. *Wounds.*—The first circumstance to be observed in a wound of the bowel is the eversion or protrusion of the mucous membrane (Fig. 190); this takes place in all injuries of this kind, and is similar, in its effects, to the contraction and retraction of the extremities of a divided artery. Its object evidently is to diminish the opening, and thus prevent fecal effusion.

This eversion of the mucous membrane never occurs in ulcerative perforation of the bowel. In this affection the morbid action generally proceeds in a slow and gradual manner, at the expense mainly of the mucous and fibrous lamellæ, which are always destroyed to a much larger extent than either the muscular or peritoneal. Hence, by the time the ulcer reaches the surface, it is impossible for the lining membrane to protrude across it, as it does when the bowel is wounded by a sharp instrument, a blow, or a kick. Another circumstance which no doubt contributes to produce this result, is the indurated condition of the serous and muscular layers immediately around the perforation, caused by the deposition of lymph during the progress of the ulcerative action.

Fig. 191.



If a small circular ligature be drawn firmly around the bowel of a dog, or other animal, the resulting effects will be very similar to those which attend the ligation of an artery. (Fig. 191.) The opposite surfaces will not only be forced into close contact with each other, but it will produce at the same time a complete division of the mucous coat. If the cord be pulled very tightly, there will be, in addition, especially in young subjects, a partial separation of the cellulo-fibrous lamella and of the muscular fibres. These effects I have repeatedly witnessed in my experiments on dogs, and they may be readily produced in the human body after death.[1] If a flat ligature be used, even when it is drawn with considerable firmness, the opposite surfaces of the tube are merely brought into contact, without any rupture of the substance of any of the tunics. The only exception to this is where the animal is very young and the parietes of the bowel are unusually tender; in which case there will be occasionally a slight division of the lining membrane, but not of the muscular fibres. When a narrow ligature is used, the parts above and below it are so closely approximated that they touch in the greater portion of their circumference; a circumstance which must necessarily exert a most favorable influence over the reparative process and the re-establishment of the continuity of the canal.

Soon after an operation of this kind, with a narrow circular ligature, inflammation is set up, plastic lymph is deposited upon and around the constricted parts, ulcerative action is established, and the cord at length works its way into the intestinal tube, where it is discharged along with the feces. The period required for the detachment of the ligature is influenced by various circumstances, the principal of which are referable to the form and size of the foreign substance, together with the force with which it is applied, the thickness of the different tunics of the bowel, the age of the subject, and the state of the general health at the time of the operation, as well as immediately after. In a small but full grown dog, killed at the end of the third day after the experiment, the ligature, which was round and narrow, had found its way through more than one-half of the circumference of the tube; and in another animal of the same kind, which died from the effects of the operation thirteen hours later, the progress of the foreign body was still greater. In the latter, indeed, the cord had entirely disappeared, having lost its hold, and escaped into the bowel, in which, after a minute examination, it was discoverd at the distance of several feet from the seat of the injury, surrounded by fecal matter. In both cases the continuity of the parts was thoroughly re-established by an abundant deposition of lymph, which, notwithstanding the brief period that had elapsed, exhibited already well-marked traces of organization. The bowel, however, presented in each instance a constricted appearance; and in one of the animals, that, namely, which was killed at the end of the third day, the opposed mucous surfaces were still in close contact, no attempt having apparently been made to restore that portion of the tube. In the other the parts were not only perfectly continuous with each other, as has just been intimated, but the cavity was partially re-established. In a third experiment, performed on a middle-sized dog, not more than eighteen months old, the ligature was found lying at the seat of the constriction, where it was retained by a layer of plastic lymph, which had sealed up, as it were, the surface of the fissure in the mucous tunic. The canal of the bowel was completely restored, and the bond of connection between the divided parts firm and organized.

---

[1] See my "Experimental and Critical Inquiry into the Nature and Treatment of Wounds of the Intestines," Louisville, 1843.

The animal was killed on the eleventh day. These appearances are exhibited in the subjoined cuts. Fig. 192 is the outer surface of the tube; Fig. 193, the internal, with the ligature *in situ*.

Fig. 192.

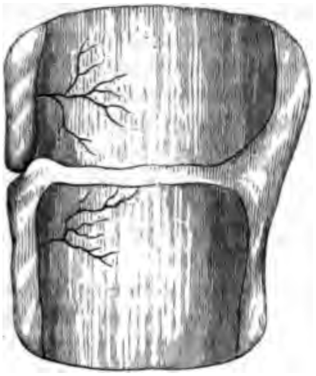
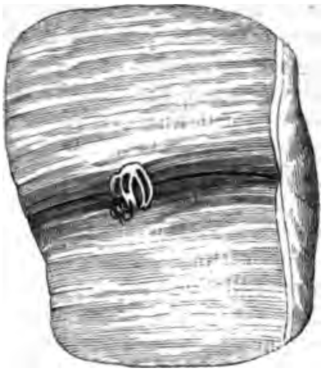
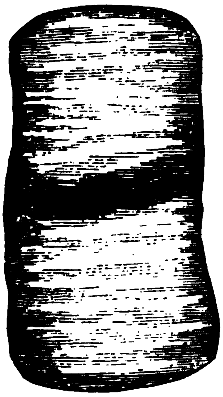


Fig. 193.



The lymph which is effused upon the external surface of the bowel, consequent upon the operation, gives the part at first a rough uneven appearance; but it gradually undergoes a sort of modelling process, and hence, if the animal survive several months, it is generally no easy matter to determine the seat of the injury. In a dog killed four months after the experiment, the reparation was so perfect that, had it not been for the attachment of a small process of omentum, it would have been impossible, by mere external inspection, to discover the place where the cord was originally applied, such were its smoothness and polish. Nor was this confined solely to the outer surface of the tube. Internally the cicatrization was almost as complete, the continuity of the mucous membrane having been everywhere re-established. There was the merest possible seam at the original seat of the constriction. (Fig. 194.)

Fig. 194.



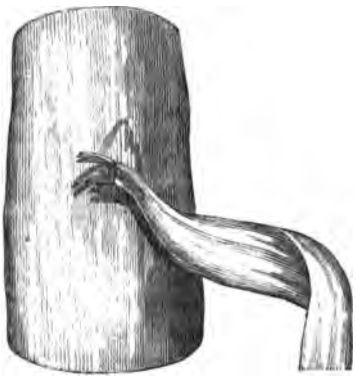
Effects similar to the above are produced when a ligature is applied around the edges of a small wound, that is, from two to three lines in diameter, provided it be drawn with sufficient firmness not to slip off. The cord gradually cuts through the different coats of the bowel, and the continuity of the canal is re-established by the effusion of plastic lymph upon the constricted part. The process of reparation, however, is not so speedily completed, owing to the breach being much wider than when a ligature is simply cast around the tube. In this case the mucous membrane is reproduced only after a long time, and the amount of lymph required is proportionally much greater. The ligature is detached at a period varying from five to ten days.

Wounds and punctures of the bowel, unaccompanied by the effusion of fecal matter, heal, when left to themselves, either by the adhesion of their edges to the surrounding parts, or by the deposition of lymph upon their surface and the gradual approximation of their lips. In the majority of cases the reparation is probably effected by the former method; since there is always a great tendency in the wounded structures to attach themselves to those in their immediate vicinity. Even wounds of large size are occasionally repaired in this manner. In some instances, again, the breach is closed by a piece of omentum, which projects into it, and fills it up like a tampon. When this happens the serous membrane is firmly fixed to the edges of the opening, and the part which corresponds with the interior of the canal and assists in maintaining its continuity, is eventually absorbed; an occurrence which leads to the gradual approximation of the lips of the wound and their ultimate reunion.

In mortification of the bowels, especially when occurring in small patches, the mode of reparation appears to be similar to that which takes place when a wound or puncture is left to itself. By the time the eschar is detached the edges of the breach will have formed adhesions to the circumjacent parts, by which the effusion of fecal matter will be effectually guarded against. Where this is prevented the patient dies from peritoneal inflammation, or an artificial anus is established.

When sutures are employed, the mode of reparation is essentially similar, whatever may be their form. The inflammation which is lighted up induces an effusion of lymph, which is speedily followed by adhesion of the injured coil to the neighboring structures, among which it is sometimes completely buried. At other times no such adhesion occurs, but the affected part throughout the entire line of suture is coated with a layer of plastic matter, by which the continuity of the serous surface is finally re-established, and the threads used in sewing up the wound are concealed from view. In almost all cases—certainly in eight out of ten—there is an attachment of the omentum to the surface and edges of the wound, which thus assists, in a remarkable degree, in the process of restoration. (See Fig. 195.)

Fig. 195.



This extraordinary tendency to adhesion in the external surface and edges of the wound to the parts around it, is nothing more than what might be expected when we reflect upon the nature of the peritoneum, and its invariable disposition, when inflamed, to pour out lymph. But it is otherwise with the mucous membrane. Here the process of reunion is not only much slower, but much less perfect; lymph is furnished very sparingly, or

quantities barely sufficient to fill the chasm between the margins
the wound; and, owing to the heterogeneous and irritating nature
the contents of the tube, a long time must necessarily elapse
ore it can become an organized or living intermedium. The
le narrow band thus formed adheres firmly to the bottom of the
und, but very slightly, if at all, for some days, to its edges. Gra-
llly, however, it becomes more and more dense; vessels extend
it from the circumjacent parts; its margins are flattened down;
, after a period varying from a few weeks to as many months, the
esion is finally completed. Subsequently, or, indeed, while the
nges just adverted to are still in progress, the new matter is nearly
absorbed, the wound greatly diminishes in width, and when the
trizing process is perfected, merely a small depression or seam
nains, to indicate the original seat of the injury. The whole pro-
may be compared to that which nature employs in the reparation
ulcers of the mucous lining of the small and large bowel. (See
s. 196, 197.)

Fig. 196.

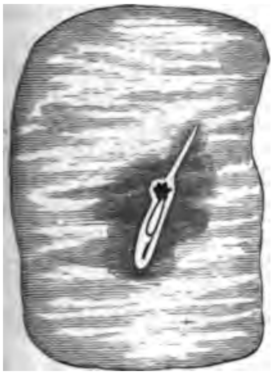
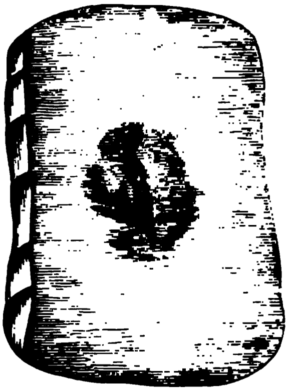


Fig. 197.



This, however, is only one mode in which the restoration of the
cous surface is effected. Another, though by no means a frequent
, is by granulation. It has been already stated that, owing to the
tating and heterogeneous character of the contents of the bowel,
lymph which is deposited upon the wound is very tardy in becom-
organized, and it may now be added that this process is occasionally
irely prevented, the substance in question being either destroyed or
noved by the fecal matter, as it passes over the affected part. When
happens, nature makes an effort to repair the breach by the forma-
n of granulations, as in similar injuries of other textures. The
cess under these circumstances is generally much more tardy than
the previous case, the cicatrization is also less complete, and the
e is much more apt to be puckered immediately around the seat of
injury.

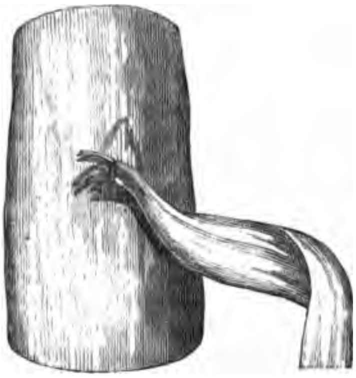
From the foregoing observations it is evident that the process of
nion is the same, whether the bowel be encircled partially or wholly

Wounds and punctures of the bowel, unaccompanied by the effusion of fecal matter, heal, when left to themselves, either by the adhesion of their edges to the surrounding parts, or by the deposition of lymph upon their surface and the gradual approximation of their lips. In the majority of cases the reparation is probably effected by the former method; since there is always a great tendency in the wounded structures to attach themselves to those in their immediate vicinity. Even wounds of large size are occasionally repaired in this manner. In some instances, again, the breach is closed by a piece of omentum, which projects into it, and fills it up like a tampon. When this happens the serous membrane is firmly fixed to the edges of the opening, and the part which corresponds with the interior of the canal and assists in maintaining its continuity, is eventually absorbed; an occurrence which leads to the gradual approximation of the lips of the wound and their ultimate reunion.

In mortification of the bowels, especially when occurring in small patches, the mode of reparation appears to be similar to that which takes place when a wound or puncture is left to itself. By the time the eschar is detached the edges of the breach will have formed adhesions to the circumjacent parts, by which the effusion of fecal matter will be effectually guarded against. Where this is prevented the patient dies from peritoneal inflammation, or an artificial anus is established.

When sutures are employed, the mode of reparation is essentially similar, whatever may be their form. The inflammation which is lighted up induces an effusion of lymph, which is speedily followed by adhesion of the injured coil to the neighboring structures, among which it is sometimes completely buried. At other times no such adhesion occurs, but the affected part throughout the entire line of suture is coated with a layer of plastic matter, by which the continuity of the serous surface is finally re-established, and the threads used in sewing up the wound are concealed from view. In almost all cases—certainly in eight out of ten—there is an attachment of the omentum to the surface and edges of the wound, which thus assists, in a remarkable degree, in the process of restoration. (See Fig. 195.)

Fig. 195.



This extraordinary tendency to adhesion in the external surface and edges of the wound to the parts around it, is nothing more than what might be expected when we reflect upon the nature of the peritoneum, and its invariable disposition, when inflamed, to pour out lymph. But it is otherwise with the mucous membrane. Here the process of reunion is not only much slower, but much less perfect; lymph is furnished very sparingly, or in quantities barely sufficient to fill the chasm between the margins of the wound; and, owing to the heterogeneous and irritating nature of the contents of the tube, a long time must necessarily elapse before it can become an organized or living intermedium. The little narrow band thus formed adheres firmly to the bottom of the wound, but very slightly, if at all, for some days, to its edges. Gradually, however, it becomes more and more dense; vessels extend into it from the circumjacent parts; its margins are flattened down; and, after a period varying from a few weeks to as many months, the adhesion is finally completed. Subsequently, or, indeed, while the changes just adverted to are still in progress, the new matter is nearly all absorbed, the wound greatly diminishes in width, and when the cicatrizing process is perfected, merely a small depression or seam remains, to indicate the original seat of the injury. The whole process may be compared to that which nature employs in the reparation of ulcers of the mucous lining of the small and large bowel. (See Figs. 196, 197.)

Fig. 196.

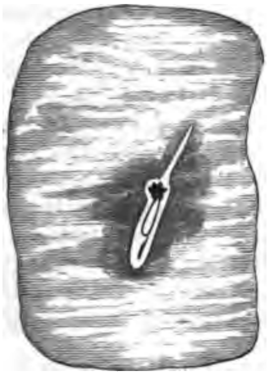
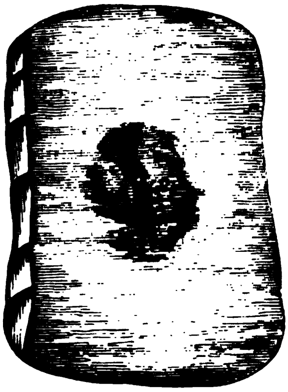


Fig. 197.



This, however, is only one mode in which the restoration of the mucous surface is effected. Another, though by no means a frequent one, is by granulation. It has been already stated that, owing to the irritating and heterogeneous character of the contents of the bowel, the lymph which is deposited upon the wound is very tardy in becoming organized, and it may now be added that this process is occasionally entirely prevented, the substance in question being either destroyed or removed by the fecal matter, as it passes over the affected part. When this happens, nature makes an effort to repair the breach by the formation of granulations, as in similar injuries of other textures. The process under these circumstances is generally much more tardy than in the previous case, the cicatrization is also less complete, and the tube is much more apt to be puckered immediately around the seat of the injury.

From the foregoing observations it is evident that the process of reunion is the same, whether the bowel be encircled partially or wholly by ligature, whether we employ sutures, or, lastly, whether the wound, provided it be not too ample, be entirely intrusted to the resources of nature. In each case the restoration is effected through the medium of plastic lymph, poured out as a consequence of inflammation, and undergoing, sooner or later, a certain degree of organization.

The manner in which the ligatures are detached varies, according to the mode in which they are applied. Both in the interrupted and continued sutures, with their different modifications, the threads, if cut off close to the surface of the wound, invariably fall into the alimentary canal, along with the contents of which they are afterwards evacuated. This, indeed, may be laid down as a law, to which I have seen no exceptions in upwards of eighty experiments on dogs.

The same circumstance, as was previously intimated, occurs when ligature is cast around a loop of intestine, or when it is employed to encircle the margins of a small aperture, whether caused by injury or mortification. If, on the other hand, the extremities are permitted to hang out at the external wound, they will be discharged outwardly, instead of inwardly, as in the former case.

16. *Artifical Anus.*—Artifical, accidental, or preternatural anus may occur in any part of the abdomen; but, as it is generally produced by gangrene of the bowel, from the pressure which is exerted upon it by hernial stricture, it is by far most frequently met with in the inguinal, scrotal, femoral, and umbilical regions, particularly the first two. For the same reason we find that the small intestine is much oftener involved than the large, which is fixed or attached, while the former is loose, floating, and consequently more liable to protrusion. Occasionally, though rarely, the abnormal anus has its seat in the lumbar region, high up in the iliac, the hypochondriac, or even the epigastric.

Three causes mainly give rise to this affection, namely, strangulated hernia, accompanied with mortification of the bowel, penetrating wounds, and stercoraceous abscess; the frequency of their occurrence being in the order here enumerated.

The external orifice of an artificial anus exhibits no uniformity in respect to its size and configuration. In many cases it is rounded, in some ovoidal, and in most irregular. In its diameter it varies from a few lines to an inch and a half or even two inches; being usually smaller in traumatic cases, or in such as result from penetrating wounds, than in those which are produced by ulceration, abscess, and especially by gangrene. The margins of the opening are thick, bevelled, depressed, or inclined towards the centre, where they are in close contact with the mucous membrane of the two ends of the bowel, the junction between them being indicated by a reddish line; they have a raw, flesh-colored appearance, and are covered with numerous granulations, which are often very painful, and so irritable as to bleed upon the slightest touch.

The depth of the outer orifice, or the distance between the skin and the bottom of the intestinal aperture, varies from three to twelve lines. It is always less when the disease is produced by a wound than when it is caused by gangrene; much will also depend upon the natural thickness of the wall of the abdomen, and the degree of plumpness or emaciation of the individual.

The external orifice is occasionally multiple; that is, instead of a single opening there are several. In this case there are usually fistulous tracks, which communicate with the main outlet, and sometimes even with each other.

The union between the two ends of the bowel and the circumference of the outer orifice is effected through the medium of plastic matter, and constitutes an indispensable element of the lesion. The inflammation, preceding and accompanying the effusion, always begins in the serous surfaces of the parts, from which it gradually extends to the other structures, as the mucous membrane, the muscles, cellular substance, and skin. The plastic matter, soft and glutinous at first, is soon organized, and thus opposes an effectual barrier to the effusion of fecal matter into the abdominal cavity. Subsequently it undergoes all the changes that lymph experiences, under favorable circumstances, in other situations. The extent of this adhesion varies, in different cases, from half a line to a line; it rarely amounts to half an inch, or, indeed, even the fourth of an inch, and in proportion as it is firm or otherwise will it be able effectually to resist the influence of such causes as have a tendency to separate the gut from the wall of the abdomen.

When the artificial anus supervenes upon strangulated hernia, the formation of these adhesions usually precedes the death of the bowel; in the traumatic variety of the affection, on the contrary, they are established after the reception of the injury, and hence the greater frequency of fatal effusion in the latter than in the former. As the adhesions extend only a small distance along the gut, a cul-de-sac is formed, the opening of which looks towards the belly, and into which the abdominal viscera may protrude, so as to complicate the disease.

Immediately around the inner margins of the outer orifice are, as was previously stated, the two ends of the bowel; lying generally side by side, like the tubes of a double-barrelled gun. Each opens by a distinct orifice, of which the upper, in time, becomes much the larger; they are bounded by a sort of villous rim, are irregularly rounded in their form, and are separated from each other by a septum or partition. The upper orifice gives passage to the feces, and, as it is unprovided with a sphincter muscle, the patient has no control whatever over their escape. The lower orifice, of the same size at first as the upper, is generally very narrow, puckered up, and sometimes even difficult to be found, especially when it has ceased for a long while to receive fecal matter. The upper opening is temporarily closed when the corresponding extremity of the bowel is touched with a probe or finger, or exposed to a few drops of cold water. When thus irritated it presents very much the appearance of the anus of the horse, the mucous lining being everted and corrugated by the peristaltic action of the muscular fibres.

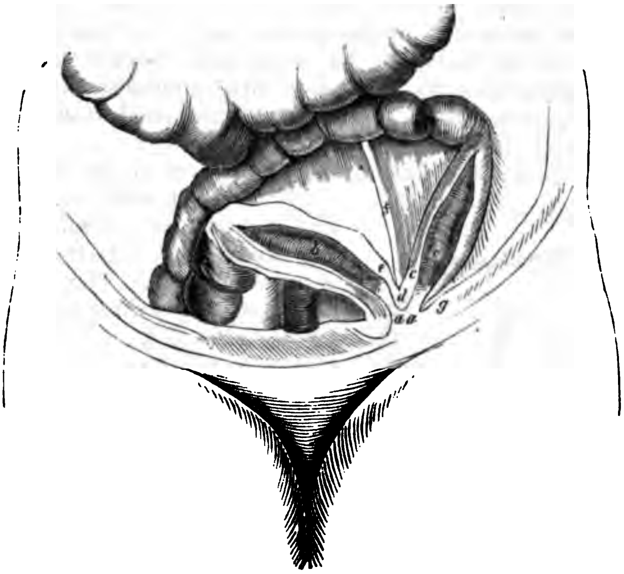
The two ends of the bowel, at first similar in size, by degrees undergo important changes. The upper continually giving vent to feculent matter, bile, mucus, and even ingesta, receives a preternatural quantity of blood, and hence generally acquires a considerable increase of volume and strength; its coats are thicker than in the normal state, the muciparous follicles are larger, the lining membrane is of a deeper red, and the peristaltic action is inordinately energetic. The lower extremity, on the contrary, having no longer any active function to perform, falls into a state of atrophy. Its tunics are pale, flaccid, and attenuated, its caliber is considerably diminished, though not obliterated, and its mucous glands are wasted and almost imperceptible. The canal contains a soft, whitish, gelatinous looking substance, which is evidently the product of an imperfect secretion, and which is voided by stool at intervals of two, three, or four months. The intestine, notwithstanding these alterations, still preserves its tubular form, however long the feces may have been discharged through the abnormal aperture.

This atrophy or wasting is not confined to the lower portion of the bowel, but often affects the corresponding part of the mesentery and even the lymphatic ganglions. As might be supposed, it is always more marked in old than in recent cases.

In artificial anus, caused by a gangrened rupture, the two ends of the bowel are surrounded and closely embraced by a sort of membranous pouch, to which the term *funnel* is applied. It is formed by the prolongation of the peritoneum which constituted the neck of the hernial sac, and varies very much in its shape, dimensions, and direction, its base being at the bowel, and the apex at the skin. It is generally very firm and dense in its structure, and from one to two lines in thickness, according to the extent of the previous inflammation; externally it is intimately united to the margins of the abnormal opening, and internally it presents a smooth, villous surface, not unlike that of an old fistulous track. The feculent matter from the upper orifice is poured into this cavity, and thence, when the artifical anus is closed, it is carried, after describing a half-circle, into the lower end of the canal. This membranous pouch is always wanting when the disease is the effect of a penetrating wound, and occasionally even when it is the consequence of a gangrened hernia: in both cases the gut adheres immediately to the edges of the opening in the muscles and integuments. The most interesting circumstance connected with this funnel-shaped cavity is the influence which it exerts upon the reparative process, or spontaneous cure, which is always so much the more prompt and perfect in proportion as it is larger and longer.

Interposed between the two extremities of the intestine, and formed by the juxta-position of their sides, is what is technically called the *ridge*, *septum*, or *partition*, of the artificial anus. (Fig. 198.) It consists of two angular or crescentic folds composed each of four lamellæ, of which the inner two are of a serous nature, and firmly united together by plastic matter, for an extent varying from one to six, eight, or even twelve lines. The outer layers are of a mucous character, and are continuous with the lining membrane of the tube, of which they form a part. Dividing the bottom of the funnel, where it is situated, into two unequal portions, this septum juts out nearer to the surface of the abnormal opening in proportion as the loss of intestinal substance has been more considerable, and the change in the direction of the tube more marked. It is small, and scarcely perceptible, when the gut has been merely pierced by a wound, or slightly affected by an eschar, but large and prominent, when the lesion, whatever it may be, involves the whole circumference of the canal. In the former case, the two orifices of the bowel are separated by a kind of gutter or groove, which directs the transit of the fecal matter from the one to the other, and greatly facilitates the attempts at cure; in the latter, the septum forms a projecting angle or buttress, which conducts the contents of the upper orifice towards the abnormal outlet, and which nothing but art can break down or surmount.

Fig. 198.



*a a*. Opening of the artificial anus, and point of union between the skin and the mucous membrane. *b*. Upper end of the intestine; *c*. Lower end of the intestine; *d*. The septum epéron, or ridge, formed by the walls of the two contiguous cylinders; *e e*. Parietes of the bowel; *f*. The ligament or cord formed by the mesentery; *g*. The cul-de-sac between the peritoneum of the intestines and of the abdominal walls, into which herniæ occasionally protrude.

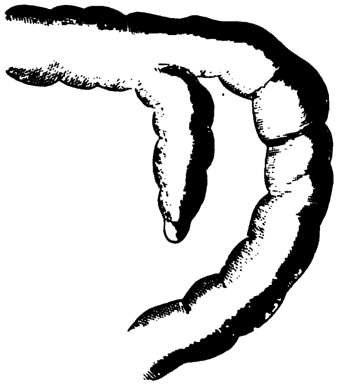
When the two lamellæ of which this septum is composed are viewed posteriorly, or from within the belly, it is found that they gradually recede from each other, leaving thus a triangular interval between them, the apex of which corresponds with the point of separation, and the base with the abdominal cavity. The surfaces of these lateral layers, which are, in fact, nothing but the parietes of the affected cylinders of the bowel, are invested by a reflection of the peritoneum, and afford attachment to a process of the mesentery.

A very serious inconvenience to which persons laboring under artificial anus are subject is the protrusion of the extremities of the gut.

This often amounts to a real prolapse, and is liable to occur, whatever may have been the cause of the disease. It may affect both ends, but the upper is more frequently involved than the lower. The extent of the prolapse varies, in different cases, from three to eight inches, as its minimum, to twelve or eighteen inches as its maximum. In its diameter the tumor seldom exceeds two and a half or three inches. It is more or less conical in its shape, contracted at the base, and perforated at the extremity by an irregularly rounded opening. The everted mucous membrane is at first only preternaturally red and vascular; by degrees, however, it becomes thickened, rugose, indurated, and completely hypertrophied.

17. *Malformations.*—Congenital development of the intestine sometimes presents itself in the form of a diverticulum, as is seen in the adjoining sketch (Fig. 199), from a specimen in my collection. The appendage, in this case, is fully three inches in length, by upwards of an inch and a third in diameter, and terminates in a conical extremity. In another preparation in my cabinet the length is somewhat less, but the diameter is quite equal to that in the other specimen.

Fig. 199.



Diverticulum of the small bowel. From a preparation in my collection.

The most common situation of these appendages is the inferior portion of the ileum, but they have been seen in other parts of the alimentary canal, as the duodenum, jejunum, colon, and even the rectum. In all the cases that I have had an opportunity of examining, I have found them to be of a cylinder figure, and to be composed of the same number of tunics as the portion of bowel with which they were connected, and of which they are, in fact, always merely so many lateral prolongations. The opening between them and the tube is of a circular shape, and destitute of valvular arrangement. Their length varies from a few lines to six inches, from two and a half to three inches being their average. Their extremity is generally free; but now and then it is attached to a neighboring coil of intestine, and several cases are related where it terminated by a small orifice at the umbilicus. A diverticulum of this kind occasionally intercepts foreign substances, as peas, cherry-stones, and pieces of bone, and thus becomes the seat of violent inflammation, followed by gangrene, or by ulceration and perforation of its walls.

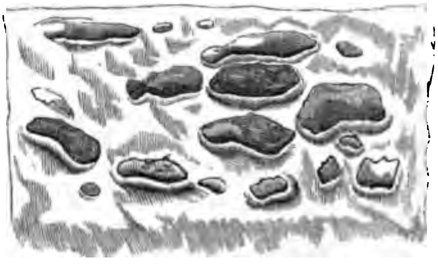
## SECTION VII.

### DISEASES OF THE LARGE BOWEL.

1. *Inflammation.*—Inflammation of the large intestine is known, at least in one of its principal forms, by the name of *dysentery*. The main seat of the morbid process is, in the majority of cases, near the sigmoid flexure; occasionally the inflammation extends up to the ileo-cæcal valve or even into the ileum. One of its first effects is to cause the epithelium to be cast off, which is seen lying in the shape of a distinct whitish layer on the mucous membrane, which becomes itself simultaneously injected, swollen, and softened. Subsequently an exudation of lymph occurs in the submucous tissue, giving rise to distinct solid protuberances. The follicles are swollen, filled with a thick secretion, and occasionally the seat of ulceration. The intestine is distended with gas, and the softened mucous membrane is covered with fecal matter, secretions from the glands, blood corpuscles and exuded lymph mixed up in a thick mass. The mucous membrane itself may ulcerate, and come off in shreds; the peritoneum loses its transparency, and its vessels are rendered preternaturally distinct. In some malignant forms of dysentery the mucous membrane sphacelates. The surface of the intestine around the disorganized mucous membrane is of a dark purple color; the submucous tissue is softened, disintegrated, and infiltrated with a purulent fluid. The softening may extend to the peritoneal coat, and perforation with fatal peritonitis result. In this form of dysentery, the mesenteric glands are of a bluish-red color, swollen, congested, and softened. When acute dysentery terminates in cure, the loss of membrane may be replaced by the formation of a new fibrous tissue; or when it assumes the chronic type, ulcers and abscesses may form in the intestine.

2. *Ulceration.*—Ulcers of the large bowel usually occur as the result of chronic inflammation of the mucous membrane or of its glands. They closely resemble those of the small, except, perhaps, that they are more frequently of a linear shape. A good idea of the character of these ulcers may be obtained from the annexed cut (Fig. 200), from a specimen in my collection. The ulcers are large, numerous, deep, and several resting upon the muscular fibres. When beginning in the mucous follicles, they are more apt to be rounded. In this case, too, their edges are often remarkably ragged, thin, and undermined; a circumstance which gives them the appearance of being much larger at the base than at the top. In such in-

Fig. 200.



Ulceration of the large bowel. From a preparation in my collection.

stances, moreover, the glands are sometimes entirely removed, or portions of them are left in the midst of the ulcerated surface, in a state of induration. Occasionally nearly the whole of the large bowel is thus affected; but the sections most frequently diseased are the cæcum and ascending colon, together with the right half of the transverse arch, whilst the rectum and the remainder of the gut are comparatively seldom implicated. In ninety-two cases of intestinal ulceration, reported by Andral, only one occurred in the rectum.

The size of these ulcers is sometimes very considerable. I have repeatedly seen them of the diameter of an American dollar, and, on several occasions, between three and four inches in length by one and a half in breadth. When of these dimensions, the abrasions are generally formed by the agglomeration of a number of smaller ones. In the linear varieties, I have, in a few instances, found the ulcers extending almost completely around the circumference of the bowel, constituting narrow grooves, of variable depths, with rough, elevated, and indurated edges. As in the rest of the alimentary tube, the ulcerative process may successively invade the different tunics, and finally lead to perforation; in which case the contents of the gut may be effused into the peritoneal sac, or else find their way into the surrounding hollow viscera. A fistulous opening sometimes forms through the walls of the abdomen, in the right iliac fossa, or in the groin, just above Poupart's ligament.

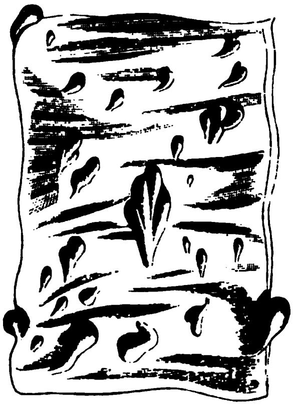
In the cure of these ulcers nature may sometimes be detected, as it were, in the very act of reparation. Thus, in the ascending colon of a married woman, thirty-three years of age, who died, gradually exhausted, after an illness of nine weeks, I found the mucous membrane very much thickened, and of a dark red color, with a deep linear ulcer two inches and a half in length by three lines in width, the surface of which was covered with small masses of plastic lymph, so firmly adherent that it was difficult to scrape them away. In this case, it is obvious, there was an attempt at cicatrization; and, had the patient lived long enough, it would, no doubt have gone on to completion. In another instance, that of a man twenty-two years old, who died of chronic diarrhœa, a small circular ulcer existed in the sigmoid flexure, the centre of which was coated with a thick layer of lymph, which had evidently been deposited only a short time previously to death.

An *abscess* sometimes forms between the coats of the large bowel. In my private cabinet is a preparation in which an abscess, of the size of a goose egg, existed in the submucous cellular tissue of the sigmoid flexure of the colon, near its junction with the rectum. The subject was a negro, twenty-nine years of age, who had labored for six weeks under all the symptoms of an ordinary remittent fever, with a pulse seldom lower than ninety-six in a minute. On inspection, I found an excavation of the size of a walnut in each superior lobe of the lung, with numerous tubercles in other parts of the organ, and a large abscess between the serous and muscular tunics of the colon. It contained about half a pint of thick, offensive matter, and its walls were in such a state of softening as to yield to the slightest traction. The abscess, in this case, was evidently tubercular, and such probably is always, in this situation, its most common character.

3. *Hypertrophy.*—Hypertrophy of the coats of the colon is rare, but by no means infrequent in those of the rectum, where it is occasionally conjoined with permanent stricture. The gut, for some distance above the constriction is usually considerably dilated, either with or without attenuation of its tunics, or the reverse. The extent to which the hypertrophy occurs, varies from a few inches to several feet; in a few instances, I have seen it involve the whole of the large bowel. The coats which are more particularly affected are the mucous and cellulo-fibrous, the latter of which especially is frequently from six to eight times the normal thickness: the muscular fibres are also apt to become very much altered, both as respects their size and color; but the serous texture rarely participates in the morbid derangement. When the hypertrophy is of long standing, the bowel almost always acquires an extraordinary degree of density, offering nearly as much resistance to the knife as fibro-cartilage, and emitting nearly the same creaking sound.

Under this head may be described the *wart-like* excrescences which are occasionally met with in the colon and rectum, and which so closely resemble those which are so often seen on the female organs of generation. Of this lesion I have seen a number of well-marked examples. In a specimen (Fig. 201) preserved in my private collection, the mucous membrane of nearly the whole of the large intestine is thickly studded with these vegetations, the smallest of which are scarcely as big as a pin-head, whilst the largest are from three to eight lines in length, by two lines and a half in diameter. The former, which are much the most numerous, are, for the most part, of a spherical shape; the latter, on the contrary, have an elongated, conical appearance, not unlike the nipples of some of the inferior animals. A few of the larger are bifid, and several adhere by a narrow pedicle, their free extremity being much broader than the attached. These singular excrescences are most abundant in the rectum and the sigmoid flexure of the colon, from which they gradually decrease in number, though not in volume, as they approach the cæcum, where they are entirely wanting. Their surface is somewhat rough, as if covered with villi, and in the recent state they were all of a dark mulberry hue. The parietes of the bowel are very much thickened and indurated, especially in the inferior three-fourths of its extent; the caliber of the tube being greatly diminished throughout. The subject of this disease was a man sixty years of age, during the last four of which

Fig. 201.



Wart-like vegetations of the mucous membrane of the large bowel. From a preparation in my cabinet.

he was constantly harassed with diarrhœa and intestinal pains, attended with gradual exhaustion and excessive emaciation.

In another specimen of a similar nature, the walls of the colon are also very much thickened, though not so much as in the preceding case, and the inner surface, besides being cellulated, like a honey-comb, is covered with an immense number of soft, fungoid excrescences, some of which are nearly half an inch in length. In their shape they exhibit almost every variety, some being conical, some spherical, and some angular. Many of them arise by a common base, and, jutting out like little slender arches, unite at the top, leaving thus a number of intervening spaces which readily admit of the passage of a large probe.

The structure of these vegetations seems to be very analogous to, if not identical with, that of the natural mucous membrane, upon which they grow, and of which they may, therefore, be regarded merely as so many prolongations. That this is the case is sufficiently obvious when we make a section of them. In the specimens in my possession, the inner surface of the colon and rectum presents thousands of hypertrophied villi, and similar bodies are plainly visible, even to the unassisted eye, on the warty excrescences. Thus, then, it may be concluded that these growths are neither villosities in a state of preternatural enlargement, nor new formations, but simply, as just intimated, so many prolongations of the mucous corion, folded over a small quantity of cellular substance. Their vascularity is sometimes very great, and there is reason to believe that they are susceptible of a species of erection.

How these vegetations originate is still a mooted question. That chronic irritation has some agency in their production cannot be doubted, as we seldom, if ever, meet with an instance in which the bowels have not been seriously and for a long time deranged; but what the peculiar modification is, and why these bodies should exist in some cases and not in others, are problems which must, for the present, remain undetermined. In one of my cases, that of a young courtesan, twenty-three years of age, there had been well-marked signs of chronic colitis for several years, with occasional intervals of perfect health. She finally died of gangrenous inflammation of the vulva and vagina, having for the last few months suffered severely from disease of the bowels, the principal symptom of which was torturing pain in the umbilical region, with frequent slimy and bloody evacuations. So also in the other case I have mentioned, chronic inflammation had invaded nearly the whole of the large bowel, and had existed for nearly four years, having been engrafted upon a severe attack of Asiatic cholera.

4. *Atrophy.*—Atrophy of the large bowel may arise from various causes, as the pressure of an abdominal tumor, the constriction of a band of adventitious membrane, the lodgement of an alvine concretion, or the presence of a tumor, benign or malignant. Permanent obstruction being thus occasioned, the tube below, pale and flabby, now only slightly stimulated by the transit of fecal matter, becomes gradually wasted, its caliber diminishing, and its coats assuming a thin, pale,

flabby appearance. In artificial anus, the result of strangulation, atrophy sometimes exists in a remarkable degree, especially in protracted cases, the bowel below the abnormal orifice being reduced almost to a solid cord, perhaps hardly the size of a finger.

5. *Heterologous Formations.*—Tubercles of the colon and rectum are observed chiefly in phthisical subjects, in which they sometimes exist in immense numbers. The heteroclite matter is deposited in the mucous follicles, which, when the softening process occurs, are converted into small ragged ulcers, the edges of which are often greatly undermined, while the base is formed either by the submucous cellular tissue, or, in the advanced stages of the disease, even by the muscular fibres. The parts around the ulcers are generally abnormally dense and vascular; more rarely pale and softened.

Melanosis is very rare, and occurs principally in small points, apparently seated in the mucous glands. Scirrhus, encephaloid, and colloid, have their seat mostly in the ileo-cæcal valve, the lower portion of the rectum, and at the anus.

6. *Post-mortem Contraction.*—In leaving this subject, there is one point upon which I deem it necessary to make a few comments. I allude to the singular contraction of the large bowel which is so frequently met with in post-mortem examinations. Every physician who is in the habit of making researches of this kind must have frequently observed this appearance. During the early period of my professional life, before I had much acquaintance with morbid structure, I was inclined to look upon this contraction as the effect of disease; and as such, there is reason to believe, it is still regarded by many at the present moment. That this, however, is not the fact generally, my experience satisfies me; and, hence, in order to avoid mistake, I would suggest that, whenever this appearance is witnessed —as it will be, I feel confident, in nine cases out of ten—the bowel should be carefully opened with the scissors, and thoroughly scrutinized, with a view of ascertaining the color, consistence, and other conditions of its several tunics.

The parts of the large bowel most subject to this contraction are the left half of the arch of the colon, the descending portion, the sigmoid flexure, and the upper half of the rectum, the frequency of its occurrence being in the order enumerated. All these parts are often narrowed at the same time, and occasionally to such a degree that the caliber of the tube is nearly obliterated. To what this condition is owing it is difficult to conjecture; nor am I able to offer any opinion upon the subject, excepting that these parts of the alimentary tube, being less liable, during the last stages of our existence, to distension by fecal matter, the muscular fibres are enabled to contract with more energy than in the rest of its extent.

## SECTION VIII.

### DISEASES OF THE VERMIFORM APPENDAGE.

The vermiform appendage, although in its structure closely resembling the rest of the intestinal canal, may, nevertheless, be considered as a distinct organ, possessing peculiar anatomical relations, and executing functions different from those of the rest of the alimentary tube. It is about three inches in length by three lines in diameter, slightly convoluted, and often considerably larger at some points than at others. Its coats are as thick as those of the cæcum, and composed of the same tissues. Not a little variety exists in relation to the size and situation of this tubular diverticulum. Whilst occasionally it is very diminutive, I have seen it, at times, nearly half a foot long, and fully as large as the little finger, without any apparent disease. The appendage may be deficient, even when the rest of the bowel is perfectly normal; and now and then it deviates remarkably from its accustomed position. In inflammation of the peritoneum it is often firmly glued to the neighboring organs, as the uterus and urinary bladder; and, under such circumstances, it has been known to produce strangulation of the small bowel.

The usual contents of the vermiform appendage are of a mucous nature, and of a soft, semi-fluid consistence. Fecal matter rarely finds its way into it; when it does, it is very apt to become impacted, and to produce mischief. Cases occur where the most violent inflammation is thus induced, followed by gangrene of the tube and general peritonitis. But the most common cause of disease, undoubtedly, is the ingress of some foreign body, such as a bean, a cherry-stone, or a biliary concretion, producing local irritation, which rapidly spreads from the mucous to the other tunics. Severe peritonitis is soon lighted up, lymph is poured out, and the appendage speedily mortifies. In another series of cases, the disease assumes a milder character, the serous membrane is comparatively little affected, there is scarcely any fibrinous exudation, and the inflammation finally passes into suppuration; or adhesions are formed between the cæcal appendage and the adjacent parts, and the extraneous body, exciting ulceration, at length escapes into some other situation.

The insidious nature of this disease is well illustrated by the following case, communicated by my friend Dr. Richards, of Cincinnati, who had also the kindness to send me the diseased bowel. The patient, a gentleman, thirty-five years of age, had enjoyed good health up to the 24th of August, 1837, when he was attacked with bilious fever. His tongue was considerably coated; there was headache, with pain in the back and limbs; the skin was hot and dry; the pulse ninety in a minute; and there was, moreover, a slight hacking cough, which, however, had been present, at intervals, for the last ten months. Under a somewhat active course of treatment, these symptoms gradually subsided, and, a fortnight from the invasion of the disease, the patient was apparently convalescent. On the evening of the same day, however, after partaking pretty freely of indigestible food, he was suddenly seized with severe pain in the abdomen, accompanied with slight distension of the hypogastric region, and great tenderness on pressure. The pulse was feeble, and one hundred and forty in the minute; the surface was cold, and bathed with profuse perspiration; and there was considerable embarrassment of breathing. These symptoms gradually increased in severity until about forty-two hours from their first manifestation, when the man expired, in a state of complete collapse. On dissection, the omentum, with nearly the whole peritoneum, was found to be highly inflamed; the bowels were distended with gas, and extensively agglutinated by coagulating lymph; the pelvis was filled with fecal matter; and there was a large, ragged ulcer in the vermiform appendage, which had perforated all the coats. Through this ulcer the fecal matter had escaped, inducing violent and fatal peritonitis. The mucous membrane of the stomach was also much inflamed, as well as incrusted with patches of lymph, but that of the intestines was perfectly healthy, except immediately around the seat of the disease.

## SECTION IX.

### DISEASES OF THE ANO-RECTAL REGION.

There are some organic lesions which are either peculiar to the rectum and the anus, or which occur so frequently in these situations as to render it proper that a short account of them should be presented in this place. Of these affections, the most important are carcinoma, ulceration, stricture, hemorrhoidal tumors, polypes, fistule, and prolapse.

1. *Carcinoma.*—Carcinoma may exist as a primary affection, or be propagated from the surrounding organs, particularly the uterus and vagina. Its most common seat is from two and a half to three inches above the inferior outlet of the bowel, though occasionally it is much lower down, as well as higher up. In a case recently under my observation, the disease involved both the margin of the anus and the lower portion of the rectum, the latter of which it encircled in the form of a dense, resisting ring, about four lines high, and more distinctly marked behind than in front, with a central opening hardly large enough to admit the middle finger. The anus was exceedingly diminished in size by two scirrhous tubercles, one about the volume of an almond, the other of a pullet's egg. The latter was ulcerated upon its inner surface, and both were the seat of sharp, lancinating pains. The patient was a young man thirty years of age, and the disease was first noticed seven months before he came under my care.

This affection presents itself either as a distinct tumor, or as an infiltration in the submucous cellular tissue, from which it gradually extends to the other tunics. Its anatomical characters are the same as those of carcinoma of the stomach and œsophagus; that is, it is either of a hard, dense, gristly consistence, with a rough, nodulated and ulcerated surface; or it is of a soft and pulpy texture, like the medullary substance of the brain; or soft and gelatinous, like the matter of colloid. In fact, cases occur in which these heterologous deposits are intermixed, or where they form different and distinct portions of the morbid mass. The mucous and muscular coats of the bowel are usually very much thickened, the former being often thrown into large, irregular ridges, in the intervals of which it is not uncommon to find small fissures, chaps, or erosions. The fleshy fibres are at first very little changed, but as the disease progresses they lose their reddish color and soft consistence, and are transformed into pale, gristly bands, possessing all the properties of the new deposit, whether scirrhous, encephaloid, or colloid. When the affection is of long standing, the hemorrhoidal vessels are always much enlarged, sometimes quite varicose, and the surrounding cellular tissue is matted into a condensed mass, destitute, in great measure, of its primitive characters.

When this disease affects the rectum, it usually terminates abruptly both above and below, but as it progresses its boundaries assume a more irregular form, and processes often extend in different directions. The degree of constriction varies from the slightest possible change of the natural caliber of the tube down to the size of a goose-quill. The bowel immediately above the seat of the disease is generally somewhat dilated, either uniformly, or, as is more commonly the case, at one or more points. Inferiorly, on the other hand, it is usually contracted; at times nearly obliterated.

The height to which the disease extends varies in different cases from one to three inches. It has been known to be prolonged to the arch of the colon, transforming all the descending portion of that intestine into a scirrhous tube, the wall of which was upwards of two inches in thickness, and its caliber almost entirely obliterated, while the inferior third of the rectum had not experienced the slightest change of structure. There is reason to believe that the disease generally, if not always, begins in the mucous follicles, from which it spreads with more or less rapidity to the other tissues. Like carcinoma in other parts of the body, it is most commonly observed in adult and advanced life, though instances of it occasionally occur at a much earlier period. It is met with in both sexes, but more frequently, according to my experience, in the female than in the male.

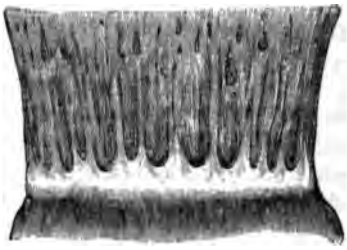
2. *Fissure.*—Fissure of the anus consists in an elongated, narrow ulcer, which commonly arises immediately above the internal sphincter, on the posterior surface of the gut, opposite the point of the coccyx, in consequence, frequently, of some mechanical cause. The bottom of the fissure, usually formed by the submucous cellular tissue, has a soft, spongy feel, but the edges are indurated and more or less prominent. The peculiar character of the disease is that it is invariably attended by spasmodic contraction of the sphincter muscles of the anus; owing

to which the patient generally experiences the most horrible torture at every attempt at defecation. Occasionally considerable hemorrhage attends it.

3. *Spreading Ulcer.*—There is a species of ulcer of the rectum to which the term spreading may be applied, from the extensive ravages it is capable of committing; it is characterized by the complete removal of a considerable portion of the lining membrane, with a dense, indurated, and almost gristly state of the muscular tunic. It usually commences about half an inch within the anus, and terminates above by a rather abrupt but very irregular line of demarcation. The ulcer frequently extends around the whole bowel, and sometimes even high up towards the sigmoid flexure of the colon.

4. *Sacs.*—The pouches which naturally exist within the cavity of the rectum, between the external and internal sphincter muscles, are liable to enlargement, in consequence of the lodgement of fecal matter, and probably also from other causes. The dilatation may affect only one sac, or several may be involved simultaneously, or successively. In degree it varies from the slightest increase of the normal dimensions to the development of a cavity, half an inch or more in diameter. (Fig. 202.) The sac never extends above the margin of the internal sphincter, but it may descend so low as to project beyond the level of the verge of the anus, in the form of a soft, elastic tumor, as large as an olive. Its lining membrane may be natural, thickened, or attenuated, and usually furnishes an abundant glairy mucus. The disease is slow in its progress; and one of the earliest symptoms complained of is an extraordinary itching or sense of weight at the anus, to which is subsequently added violent smarting pain during every attempt at defecation.

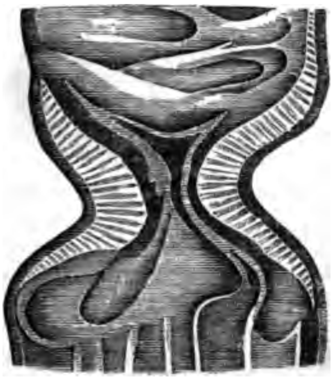
Fig. 202.



Pouches of the rectum. From a preparation in my collection.

5. *Organic Stricture.*—This disease consists in a thickened, indurated condition of the mucous and cellular textures, by which the caliber of the tube is more or less contracted. A smooth gristly ring is thus formed, from a few lines to half an inch in depth, above and below which the bowel commonly retains its natural structure. (Fig. 203). The thickening does not, however, always embrace the entire circumference of the rectum; not unfrequently, indeed, it forms a mere segment of a circle, and is so arranged as to give the villous tunic in the immediate neighborhood a remarkably puckered appearance. When the ring is complete, it strongly re-

Fig. 203.



Organic stricture of the rectum.

sembles a scirrhous pylorus. Hypertrophy of the muscular tunic is also occasionally observed, but the peritoneal is seldom implicated.

The common seat of organic stricture is about three inches above the anal orifice. Cases, however, are frequently observed in which it is much lower down or higher up. The disease spares neither age nor sex. Whilst it is not usual about the meridian of life, it has been repeatedly witnessed in children as early as the eighth year, and in the old as late as the eightieth.

The bladder is sometimes excessively irritable in this disease, from the pressure of the loaded gut; and occasionally fistules form in the nates and perineum. In the female, a communication frequently takes place between the rectum and the vagina; and in the male a similar passage may be established, though more rarely, between the rectum and the bladder.

A *spasmodic stricture* of the rectum, caused by an irregular contraction of the muscular fibres, is sometimes noticed. It is most common in the upper portion of the tube, and is probably dependent upon a vitiated state of the secretions.

6. *Polypes.*—Polypes of the rectum may occur at any period of life, but are most common in children under ten years of age. Occasionally they are observed soon after birth, and hence it has been inferred, and not without reason, that they may exist as a congenital vice. Almost always single, there are sometimes as many as three, four, five, or even half a dozen. Their ordinary situation is from one to three inches above the anus. When there are several such tumors they usually occupy different portions of the circumference of the gut, and the highest may then be entirely beyond the reach of the finger. In their shape they may be globular, ovoidal, pear-like, or vermiform; in their size they vary from that of a cherry to that of a hickory-nut, a hen's egg, or a small fist. They are of a soft spongy consistence, and of a pale rose color, bright red, purple, whitish, or dirty drab. Their attachment is usually by a narrow, slender pedicle. In one instance I saw a growth of this kind, not larger than a common hickory-nut, with a thin pedicle four inches in length.

Fig. 204.

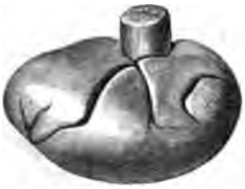
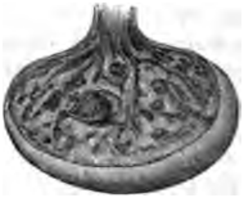


Fig. 205.



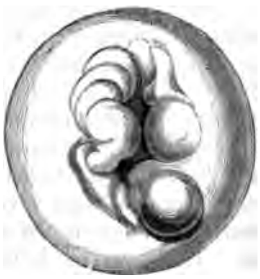
Polype of the rectum; Fig. 204 showing its external appearance; and Fig. 205 its internal structure.

They are composed of a cellulo-fibrous, fibrous, or gelatinoid texture, and are invested by a prolongation of the mucous membrane. Their surface, which is generally smooth and regular, is sometimes remarkably rough, knobby, mammillated, or lobulated, giving the part the appearance of consisting of several distinct masses. In a preparation, presented to me by Professor Hardin, of Kentucky, the tumor has a singularly porous appearance, very much like that of a sponge. The openings, which exist in immense numbers, freely communicate with each other, and vary in size from the smallest pin-head to that of a pea. The largest, as I have ascertained by a careful inspection, were filled with a white inspissated mucus, which was easily pressed out with the finger, and the removal of which was followed by a considerable diminution of the tumor, originally about the volume of a hen's egg, and of an oblong reniform figure. It was of a bright red color before removal, bled freely at every point of its surface when touched or irritated, and was suspended by a rounded pedicle, two inches long by four lines in diameter. This pedicle took its rise a little above the sphincter muscle on the right side of the rectum, communicated to the finger a pulsation as strong as that of the radial artery, and was inserted into the centre of the tumor very much as the stem is into an apple. The subject, a boy ten years old, had labored under the disease six years. The form and structure of the tumor are exhibited in Figs. 204 and 205.

Owing to the constant contact of fecal matter, polypes of the rectum are liable to inflame, to ulcerate, and probably, also, to assume a malignant tendency. When very vascular, they are apt to bleed freely, especially when they are roughly handled or irritated. The mucous coat immediately around them may be perfectly natural, or it may be thickened and changed in color.

7. *Hemorrhoids.*—Hemorrhoids may be distinguished into two varieties, one of which essentially consists in a varicose and erectile condition of the vessels, the other in the formation of a small sac filled with blood. In the latter case, the disease presents itself in the form of one or more rounded, or ovoidal tumors, seated at the verge of the anus, or just within the external sphincter. In their size, they vary between a cherry and an almond (Fig. 206); they are of a soft, spongy consistence, and their color is either lilac, red, or livid, according to their age and the degree of pressure exerted upon them by the surrounding parts. When old, they often appear like hard, indurated knobs, quite pale, and almost devoid of sensibility. The manner in which these tumors are produced is easily explained. In straining at stool, or in riding on horseback, a hemorrhoidal vein gives way, and blood is extravasated into the connecting cellular tissue, where it forms a circumscribed swelling, covered partly by skin, partly by mucous membrane. The blood is at first perfectly fluid, but in a short time it coagulates, and subsequently undergoes the same changes as in apoplexy of the brain. These circumstances satisfactorily account for the difference of color and consistence between a recent and an old hemorrhoidal tumor, as well as for the great facility with which the blood can be pressed

Fig. 206.



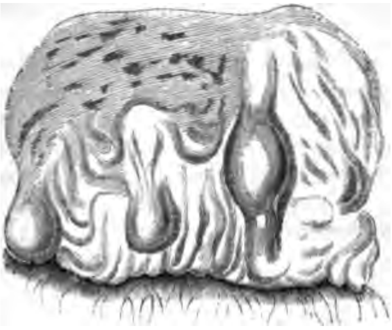
External hemorrhoids. From a preparation in my collection.

out of the sac in the one case, and the great firmness with which it adheres to its walls in the other.

The blood which is effused in this variety of the disease may be entirely absorbed; but more commonly it remains, and is gradually converted into a tough fibrinous substance, of a pale reddish or grayish color. Vessels extend into it from the parts by which it is covered, and in this manner it becomes at length inseparably united with the inner surface of the sac. These tumors are generally the cause of the pale, flabby, and corrugated excrescences, so frequently noticed at the verge of the anus, and the interior of which is occasionally of a hard fibrous consistence, similar to indurated cellular tissue.

This variety of hemorrhoidal tumor differs remarkably from the one next to be described in that it never bleeds, and in being of a lighter color. It is most frequent after the age of twenty-five or thirty; but in a few instances I have met with it in very young children, without any assignable cause. It is exceedingly common in females, during the latter months of utero-gestation.

Fig. 207.

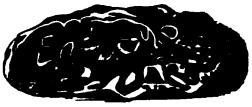


Internal hemorrhoids. From a preparation in my cabinet.

The second form of hemorrhoidal tumor is produced by the dilatation of the capillary vessels of the mucous membrane, just above the internal sphincter muscle. (Fig. 207.) The disease is generally slow in its progress, and often exists for a considerable period before it is detected. Certain occupations predispose to its occurrence, and it seems to be more frequent in the male than in the female. It seldom appears before the twenty-fifth year, and is most common after the age of forty.

The tumors in this variety of the affection are of a soft, spongy consistence, erectile, and remarkably prone to hemorrhage, the blood often spirting from them in a full stream. In their color, they vary from a light red to a deep purple; their volume may equal that of a pea, a filbert, or an almond; their number seldom exceeds three or four, though I have counted as many as eight in the same subject. They are usually isolated, but now and then they are grouped together, so as to form a mass several inches in diameter. They may involve the entire circumference of the gut, or be confined to particular parts of it. Their surface is frequently incrusted with coagulating lymph, and the mucous membrane over them is liable to give way from the most trifling causes, followed by more or less hemorrhage. Sometimes the blood oozes out at numerous points, by a process of exhalation. The bleeding, however induced, may amount to several ounces a day, and is sure, if long continued, to be attended by an anæmic condition of the system, with partial or complete prolapse of the mucous membrane. To this form of the disease the term bleeding or internal piles is usually applied. Fig. 208 shows the spongy, porous structure of this form of the disease.

Fig. 208.



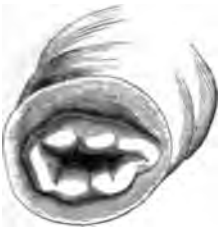
The minute structure of an internal hemorrhoidal tumor.

A tumor, very different in its character from the true hemorrhoidal, is sometimes met with at the verge of the anus, principally as the result of severe straining at stool, or of rough horse-back exercise. It consists of an effusion of serum in the submucous cellular tissue, in the form of a rounded, or ovoidal elevation, from the volume of a cherry to that of a small hickory-nut; it is of a pale yellowish color, or nearly perfectly white, almost transparent, glossy, and very much like the vesicle of a common blister. It pits slightly under the finger, and generally attains its full size in ten or fifteen hours. A few delicate straggling vessels, the color of which beautifully contrasts with that of the other parts, may often be seen ramifying over its walls, or intersecting its substance. The tumor, although sometimes multiple, is almost always solitary. The disease is strictly analogous to œdema of the vulva and glottis.

The *warty excrescences*, so frequently observed at the verge of the anus, may be the remains, as already stated, of shrunken hemorrhoids, or they may be formed by a dense, thickened, and hypertrophied condition of the common integuments and submucous cellular tissue. In the latter case, the tumors are external from their earliest development, which is caused either by continued friction, by habitual straining, or by want of cleanliness. They are of a flattened, oblong shape, mammillated, irregularly rounded, or conical, dense and firm in their consistence, indolent, or insensible, and of the same color pretty much as the skin, except when they are inflamed or highly congested, when they are red or purple, and extremely painful. Their number is variable, but there are seldom more than three or four. Excrescences of this description may attain the volume of an almond or a small fig. They never bleed, but they may ulcerate, and become the seat of a purulent or thin sanious discharge. When very old they are generally of a hard, fibrous, or fibro-cartilaginous structure, from the effects of interstitial changes.

The veins of the rectum, like those of the abdomen, the spermatic cord, and lower extremity, are liable to *varicose enlargement.* This state may exist alone, or in association with hemorrhoidal formations. The dilatation may affect a single trunk, or a considerable number, either simultaneously, or successively; and may extend as high up as the commencement of the sigmoid flexure of the colon. The veins are knotty, convoluted, thinner in some places than at others, and four or five times the natural size. Occasionally they are hard and firm, or soft and friable. The surrounding parts are thickened and œdematous. The cause of this affection is purely mechanical, and consists in whatever has a tendency to interfere with the passage of the venous blood. The distended veins sometimes burst, and thus give rise to more or less hemorrhage.

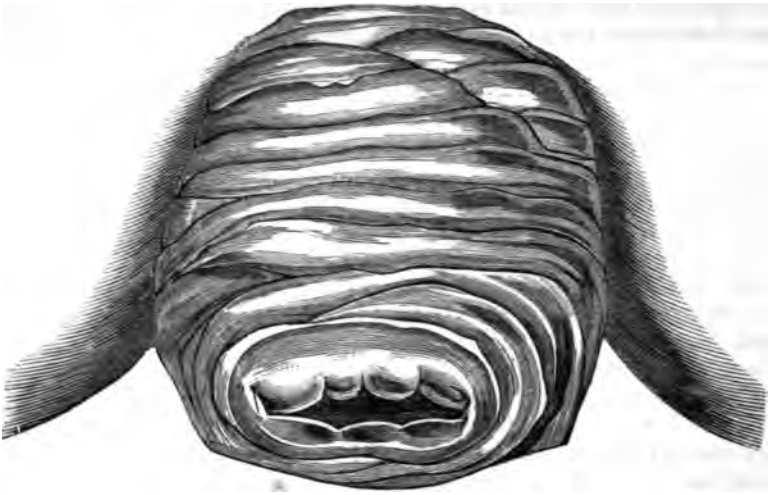
Fig. 209.



Partial prolapse of the rectum. From a preparation in my cabinet.

8. *Prolapse.*—Of prolapse of the rectum there are two forms. In the first (Fig. 209), which may be termed the partial, the mucous membrane of the lower bowel alone is everted, so as to present the appearance of a ring. It is usually observed in the vigor of life, and very frequently depends upon the presence of hemorrhoids. In the second variety (Fig. 210), there is a descent of all the coats, the whole or the greater portion of the rectum falling through the external sphincter muscle. The extent to which the protrusion occurs varies from a few lines to six or ten inches. In cases of the latter kind, it is probable that there is a real invagination of the sigmoid flexure of the colon; for it is difficult to conceive how the rectum could suffer the requisite displacement, even supposing that it possessed the necessary length. When the prolapse is complete, as in the form of the lesion now under review, the tumor is commonly of an irregularly globular figure, and varies from the size of an egg to that of the two fists, the mucous membrane being of a dark livid color, from the constriction of its capillary vessels, and affording a thin, bloody secretion, not unlike red currant jelly, both in appearance and consistence. If the parts be allowed to remain long in this situation, they become not only very much thickened, but gradually rough and callous. Protrusion of all the tunics occurs chiefly in children and aged persons, particularly in females of relaxed frame.

Fig. 210.



Complete prolapse of the rectum.

9. *Fistule.*—A fistule is a small narrow passage, which has one of its openings in the neighborhood of the anus, the other in the rectum;

in some instances, the upper extremity of the tube terminates blindly as a cul-de-sac. Its length varies from a few lines to several inches; its diameter generally equals that of a common probe, and occasionally that of a goose-quill. A channel of this kind is either straight or crooked; and when several coexist, they not unfrequently communicate with each other. Internally, it is lined by a layer of adventitious membrane, the surface of which, usually somewhat rugose, is constantly bathed with purulent matter either alone, or mixed with feces. A fistule is always preceded by an abscess, and may therefore be considered as a consequence of its imperfect restoration.

The number of external openings varies in different individuals. Generally there is but one; but sometimes two, three, or even more exist. In a preparation in my possession, there are as many as seven, situated at various points of the nates. When the number of apertures is very great, the integuments have a cribriform or sieve-like aspect, the subjacent cellular substance is extensively destroyed, the surface is of a marbled or pale livid color, and there is a constant discharge of thin, sanious, and offensive fluid. This form of fistule is most frequently observed in phthisical subjects and habitual drunkards. When there are several orifices, the surrounding parts are generally very callous, more or less red, and studded with fungous granulations, especially in cases of long standing. In regard to their shape, the external openings exhibit endless variety; being sometimes round or circular, but more frequently ragged and irregular.

There is seldom more than one internal opening; sometimes, however, there are two; and cases have been observed where there were as many as three. In a sailor, upwards of fifty years of age, on whom I operated for this disease before the medical class in the winter of 1843, there were not less than four internal orifices, situated within a short distance of each other. The aperture is usually soft and irregular, rarely round, or callous. It is commonly situated at the side of the anus, seldom in front, and still more rarely behind.

The precise point at which the internal orifice opens is worthy of notice. Until recently this was supposed to be high up, at the distance of two, three, or even more inches from the external outlet. It is now well ascertained that this is not the case, but that the orifice is generally very low down, that is, just above the point where the internal membrane of the rectum unites with the skin, sometimes a little higher up, but never more than five or six lines. I have never found the seat of the internal opening higher up than half an inch, and generally, indeed, not more than two or three lines. In all my operations for this disease, my practice, before dividing the parts, has been, for many years, to expose the internal orifice by means of a flexible director, brought out at the anus; a proceeding which could not be accomplished if the opening were situated at a considerable elevation.

10. *Malformations.*—Malformations, often incompatible with the perpetuation of life, are sometimes witnessed in the anus and lower extremity of the rectum. When the anus is absent, the large bowel is either partly or entirely deficient, or else opens in a cul-de-sac,

some distance above the usual place. Occasionally the aper closed simply by a thin fold of membrane, not unlike the female which may be easily divided with the knife, and the infant Sometimes nearly the whole of the large intestine is wanting, the case with a fœtus which I dissected a few years ago, in whi ileum terminated in a capacious cul-de-sac, two inches and a length, which floated loosely in the pelvic cavity. At other again, the anus and rectum are natural, whilst the colon is absent or so contracted as to render the continuance of life imp Instances occur, also, where the rectum opens into the urinar der, the urethra, or the vagina; thus affording an approximatio cloaca of birds, and of some fishes.

---

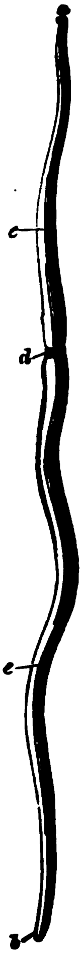
## SECTION X.

### INTESTINAL WORMS.

Five species of worms inhabit the intestinal tube of the subject, the lumbricoid, vermicular, trichocephaloid, the long ta the broad tape. These worms are not peculiar to man: they freq occur in the inferior animals, and, as might be supposed, t have a decided predilection for particular parts of the alimentar some selecting the small, others the large bowel. How these p beings originate is still a mooted point with pathologists: all a agreed, however, in the belief that they must arise in one of tw either from the germs of animals, introduced into the body fro out, or derived from the parent, or else by spontaneous gen It does not accord with the plan of this work to enter into a d the various arguments that have been adduced by the advoc these two questions: suffice it to say that the doctrine ascribin to spontaneous generation occurring within the body, has n followers. The most commonly received opinion is that these are developed from ova which may be introduced from witho may also certainly be derived from the parent, as the circun that they have been repeatedly seen in the fœtus amply proves. ringius mentions the case of an immature fœtus, in whose s he found several lumbricoid worms; and instances of tape- having been discovered under like circumstances are narrated las, Heine, and other authors. Rudolphi and Bremser refer to rous examples of worms existing in the fœtuses of various q peds, and also in those of birds which had just escaped from th

The *lumbricoid worm* (ascaris lumbricoides, lumbricus teres), name indicates, is of a cylindrical shape (Fig. 214), gradually ta towards each extremity. It is marked by numerous circular and by four longitudinal lines, of which the dorsal and vent whitish, the two lateral ones dark and opaque. The head is vular, without wings or processes; and the digestive tube, whic in a straight course, terminates a short distance from the tail in a transverse fissure. The length of this worm is from three to twelve

Fig. 211.



**Ascaris** lumbricoides: *a.* Anterior extremity; *b.* Posterior; *d.* Vulva; *e e.* Longitudinal lines.

Fig. 212.

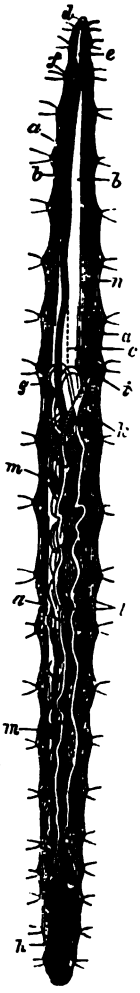


Fig. 213.

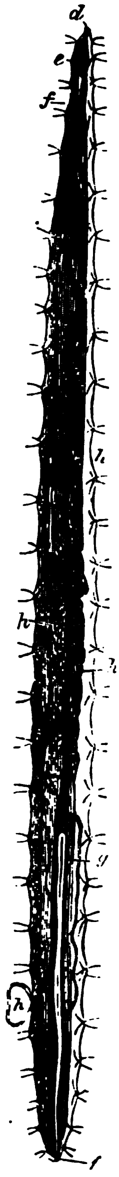
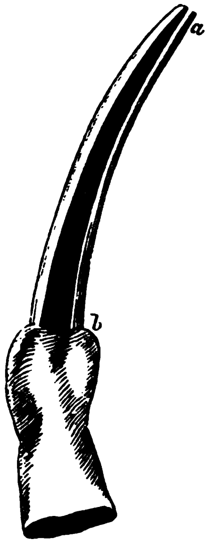
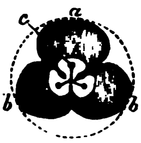


Fig. 214.



Penis of the ascaris lumbricoides magnified; *a.* Extremity; *b.* Base.

Fig. 215.



Head and mouth of the ascaris; *a, b b.* Tubercles; *c.* Oval aperture.

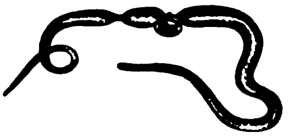
Fig. 212.—Organs of the female ascaris: *a.* External tunic; *b b.* Muscular fibres; *d.* Mouth; *e.* Œsophagus; *f.* Alimentary tube; *k l m n.* Generative organs.

Fig. 213.—Organs of the male ascaris: *d.* Mouth; *e.* Œsophagus; *h h.* Generative organs; *f.* Intestine; *g.* Penis.

inches; its thickness about that of a goose-quill; and its color of a reddish-brown, bordering upon yellow. The male is much more slender than the female, from which it is readily distinguished by the singular curve of its caudal extremity, and by its forked penis.

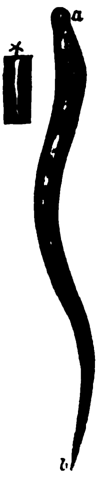
This species of worm exhibits a high degree of organization, being furnished with integuments, a muscular and digestive apparatus, and well-developed sexual organs, together, as is supposed, with a nervous and circulatory system. (Figs. 212, 213, 214, 215.) Its natural residence is in the small intestines, where it often occurs in considerable numbers. It has also been found in the large bowel, in the stomach, biliary ducts, œsophagus, fauces, and even in the larynx. In the latter situation it has been known to cause suffocation.

Fig. 216.



The usual number of this species of worm ranges from one to two or three dozens. Occasionally, however, it greatly exceeds this. Thus, Dr. Gilli,[1] of Turin, saw a child who voided, in the course of eight days, five hundred and ten; and a still more extraordinary case has recently been related by Dr. J. W. Hamilton, of Ohio, in the *Western Journal of Medicine and Surgery*. In this instance upwards of eleven hundred, from three to nine inches in length, were expelled in less than three months. About sixty, rolled up in a complete ball, came away at one time. The patient was between two and three years of age.

Fig. 217.



a, head; b, tail; *, natural size.

The lumbricoid worm sometimes twists itself into a knot; and, in a remarkable instance, of which the adjoining sketch (Fig. 216) is an accurate representation, an animal of this description became entangled in the eye of a button, which made two circular impressions, nearly an inch apart, upon its body. This anomalous specimen is now in my private collection.

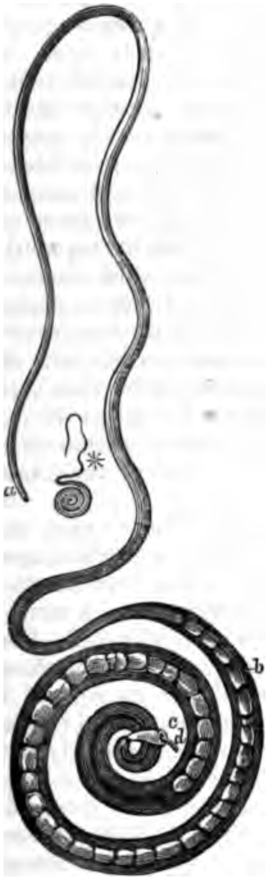
The *vermicular species* (ascaris vermicularis, oxyurus v., fusaria v.), is extremely small and delicate (Fig. 217), the male being not above the sixth of an inch in length, with a very thin, tapering body, of a whitish color. The mouth is of an orbicular shape, with a bladder-like, transparent membrane on each side: the tail is spiral and obtuse, and the sexual organ is contained in a sheath. The female is considerably larger, being from four to six lines long, and its tail is as fine as the most delicate needle. The heads of these worms are in constant motion, from which circumstance they are often called leap-worms: from the uneasy, gnawing sensation which they are supposed sometimes to occasion in the stomach, they have also received the name of maw-worms; and, from their filiform configuration, they are vulgarly termed thread-worms. They are found only in the large intestines, especially in the rectum, where they are often collected in vast multitudes, wrapped up in thick, viscid mucus. In females, these worms sometimes pass into the vagina, and give rise to much uneasiness.

---

[1] Brit. and For. Med. Rev., vol. xv. p. 248.

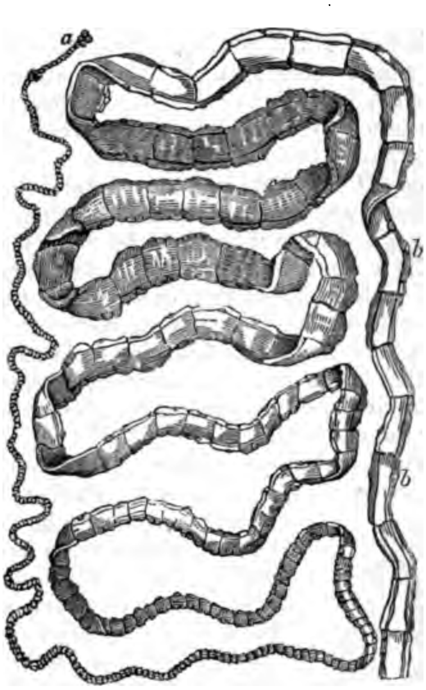
The *trichocephaloid* (trichocephalus dispar, trichuris, ascaris trichuria), *hair-worm*, or *thread-worm* (Fig. 218), as it has been variously denominated, is principally found in the cæcum, and is very common in the inhabitants of England, Ireland, France, Italy, and Germany. It is also frequently met with in the inferior quadrupeds, especially the monkey, dog, and fox. This species is from one and a half to two inches in length, with a white, cylindrical body, which is almost as thin as a horse-hair anteriorly, the remaining third being considerably stouter, and terminating in a rounded extremity. The mouth is orbicular, the head extremely slender, and the capilliform portion transversely striated: the alimentary tube runs in a straight course from before backwards, and terminates in the thick bulbous part, where it assumes a flat, spiral form. The male is the smallest, and is

Fig. 218.



*a. The head; *b.* Intestines; *c.* Sheath; *d.* Penis; *, natural size.

Fig. 219.



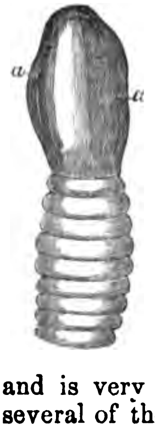
*a. Head; *bb.* Lateral orifices.

distinguishable from the female by the sexual organs, which are inclosed in a sheath, by the greater brevity of the anterior capilliform portion, and by the peculiar circular whirl of the tail.

The *long tape-worm* (tænia longa, tænia solium, tænia cucurbitiva) naturally infests the small intestines; but it has also been observed in the stomach, colon, and rectum (Fig. 219). This species is of frequent occurrence in different sections of the United States and Europe; and, according to Hasselquest, it is also very common in many parts of the East, especially amongst the Jews at Cairo, large numbers of whom are affected with it. The long tape-worm is of a whitish color, from three to six lines in width, and of the average length of sixty feet. Occasionally the length is enormous. Bremser relates a case where it was one hundred and fifty feet, and others are given where it was above three hundred. Towards the anterior part, this worm suddenly tapers off into a very fine thread-like extremity, which is surmounted by a small hemispherical head, provided with four lateral suckers. The body is flat, rough, and composed of numerous joints, on one edge of which there is a slight projection, pierced by a minute aperture. The configuration of the articulations, their relative length and breadth, are much influenced by the movements of the animal, and cannot be specifically defined. The worm is rarely expelled entire: most commonly it is voided in pieces several feet long, and not unfrequently it comes away in single joints, looking like so many gourd seeds. In its organization it seems to be greatly inferior to the preceding species, being a homogeneous cellulo-gelatinous mass, with an alimentary canal, but without distinction of sexes, or trace of a nervous system. This variety of tapeworm seems to be at once androgynous and hermaphrodite; each joint contains male and female organs, filled with ova, so that impregnation occurs by means of the approximation of two individuals, or, as is more commonly the case, by that of the joints of the same animal.

The *broad tape-worm* (tænia lata, bothriocephalus latus, tænia membranacea) seldom exceeds fifteen feet, though occasionally it attains a much greater length. It is white, flat, from six to ten lines in width at the broadest part, which is near the middle, and consists of a series of concatenated joints, the intervals between which grow successively longer the nearer they approach the tail. In its general features, it bears a pretty close resemblance to the long variety; but the articulations are comparatively larger and stronger; the flattened surface of each link is perforated by a small hole, and the head of the animal (Fig. 220, *a a*), when seen by means of a lens, is found to be of an elongated, elliptical shape, with a large fissure on each side of it. Both extremities are remarkably attenuated, especially the anterior, which is often perfectly thread-like for twelve or fifteen inches. This worm inhabits the upper portion of the small bowel and is very common in France, Switzerland, Poland, and Russia, several of them often coexisting in the same individual.

Fig. 220.



# CHAPTER XXI.

## PERITONEUM.

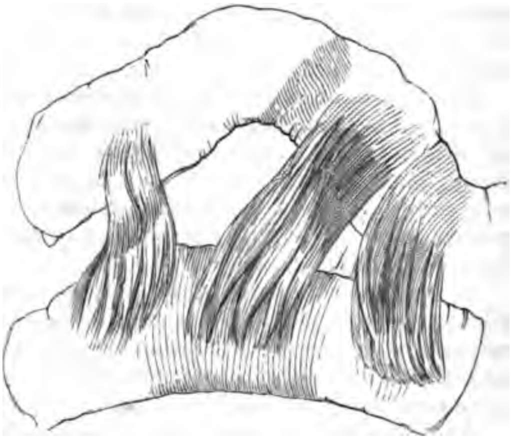
**Is liable to different forms of Disease.—Acute Inflammation.—Deposition of Lymph.—Effusion of Serum, Pus, and Blood.—Softening of Subserous Cellular Tissue.—Parts of the Membrane most apt to suffer.—Development of Vesicles.—Chronic Irritation.—Agglutination of the Bowels and formation of False Passages.—Ascitic Effusions.—Generation of Gas.—Tubercles.—Carcinomatous Growths.**

The lesion of the peritoneum may be referred to inflammation, tubercles, melanosis, and cancerous growths. A very brief description of these several pathological states must suffice.

1. *Acute Inflammation.*—The common characters of acute inflammation are increased vascularity, opacity, exudation of lymph, and effusion of serous fluid. The redness is generally of a florid tint, and is either punctiform, arborescent, stellated, or patch-like, being always most intense in those cases where there is least secretion. Under opposite circumstances, indeed, the redness is sometimes scarcely perceptible, and may even be entirely absent; not so much, perhaps, from the reflux of blood from the capillaries during the agonies of death, as from the manner in which they are drained during the violence of the inflammatory excitement.

Occasionally small ecchymoses are observed; and, in almost all cases, the membrane loses a considerable share of its transparency, assuming an opaque, turbid, whitish, or milky aspect. Much has been said concerning the thickening of the peritoneum in this disease; but if this condition ever occurs, it must be very rare.

Fig. 221.



False membrane of peritonitis. From a specimen in my cabinet.

By the time the redness is fairly established, the affected membrane throws out coagulating lymph and serum. Whether both these substances are separated simultaneously, or one precedes the other, are points which are not fully settled. By some it has been supposed that the lymph is deposited first; whilst others maintain that the priority, if any, is always determined by the intensity of the inflammation. According to this theory, when the disease is very mild, serum seems to be thrown out first; but, if the excitement is very acute, the earliest product is lymph. To me it appears more than probable that both substances are eliminated at one and the same time, as we have reason to believe they are in the pleura and pericardium.

At first, the lymph has a soft, unctuous feel; but by degrees it becomes dense, firm, and organized, vessels being either developed in its substance, or else shooting into it from the surrounding parts. The period at which it is vascularized varies in different cases, from thirty hours to several days, or weeks. Of the numerous forms which this matter assumes, the band-like is by far the most common. (Fig. 221.) Not unfrequently, however, we find it deposited in small amorphous masses, filling up the intervals between the convolutions of the intestines, and gluing them more or less closely together. In some instances, again, this substance covers and unites the abdominal viscera in one confused mass. When partial, these adhesions sometimes induce fatal mischief, by strangulating the bowel.

The lymph is sometimes deposited in distinct layers, varying in thickness from the finest silk to the coarsest cassimere. Of a light grayish tint, they are perfectly smooth and transparent, and often contain long, slender vessels, filled with florid blood. Such adventitious membranes, from the manner in which they are attached to and spread over the surface of the bowels, may form small pouches, distended with serous fluid.

The *serum* poured out in this affection varies in quantity from a few ounces to several pounds, being always much less than in chronic peritonitis. In its color, it differs in different cases. Sometimes, especially when the inflammation is partial, it is clear and limpid, like water; at other times, it is of a pale reddish hue, whitish, or milky; and not unfrequently it is mixed with flakes of lymph, or possesses all the sensible properties of pus.

An effusion of *pus* is a frequent termination in fatal cases, and occasionally takes place at a very early period of the disease; but in general it is not considerable in quantity until the affection has existed for some time. There is no breach of continuity of the peritoneum in suppuration. The color and consistence of the pus are various, being white, greenish, milky, or reddish, with shreds of membrane, flakes of lymph, or dots of blood.

In very violent grades of this disease, it is not uncommon to find an effusion of pure *blood.* It usually presents itself in the form of clots, without any breach of continuity or rupture of the vessels. The quantity is sometimes quite considerable, and in all the cases that I have seen the peritoneum exhibited evidence of high inflammation.

Another effect of peritonitis is *softening* of the subserous cellular substance. This lesion, although principally observable in the acute form of the disease, is by no means peculiar to it. It is generally associated with sero-purulent effusion, and is particularly conspicuous in the pelvic portion of the peritoneum, in the persons of lying-in females, and in those who fall victims to injuries of the rectum and urinary bladder. The softening, which sometimes involves a large extent of surface, often amounts to such a degree as to permit the serous membrane to be peeled off with the greatest facility from the organs which it serves to envelop. A similar pathological condition is occasionally seen concurrently with the preceding, in the submucous cellular substance of the stomach and bowels, produced, in all probability, by an extension of the irritation from the serous envelop.

All parts of the peritoneum are not equally liable to inflammation, the portions most commonly affected being the broad ligaments of the uterus, and the covering of the small intestines, especially of the ileum, together with the tunic of the spleen and liver. The parietal part of the membrane is rarely implicated; and the same remark is applicable, in a still higher degree, to the serous envelop of the stomach. Indeed, serous gastritis must be regarded as an extremely infrequent disease. In all my dissections, I cannot recall more than a few instances in which this portion of the peritoneum betrayed the least sign of acute inflammation. The organ, it is true, is occasionally found glued to the neighboring structures, as the spleen, diaphragm, or arch of the colon; but even this circumstance is far from affording conclusive evidence that it was the seat of the effusion which led to this pathological condition.

Nor does the disease remain always confined to the original seat of the attack. Thus it often happens that the external coat of the bowel is inflamed in the first instance, and that the irritation is afterwards propagated, either rapidly, or step by step, as it were, to the other layers, or even to the wall of the abdomen.

In puerperal peritonitis, the inflammation frequently commences on the internal surface of the uterus, and progresses until it reaches the peritoneal coat. From thence, the process may diffuse itself over the whole peritoneum, or remain confined to the portion covering the uterus and adjacent organs.

A development of *gas* is sometimes noticed in this disease. It is more common, however, in chronic inflammation, attended with copious sero-purulent effusion, and is probably caused by the decomposition of this fluid. Another effect is the formation of little *vesicles*, produced by the presence of air in the subserous cellular tissue. It is an evidence of a high degree of morbid action.

Acute peritonitis generally ends favorably or fatally in from five to ten days from its invasion. Occasionally it is disposed to run into *gangrene*. This termination, which is more liable to occur here than in any other serous texture, is anatomically characterized by the black grayish color of the affected part, by its soft, pulpy consistence, by its disagreeable, fetid odor, and by the facility with which it can be scraped off from the subjacent structures. If there be any adventitious membrane, it usually participates in the disorganizing process, assuming the same appearances as the pre-existing texture.

2. *Chronic Inflammation.*—In chronic peritonitis, the affected part is of a dull, rather dark color, the vessels are more dilated, and the sub-

jacent cellular tissue is more dense and thick. The serous texture itself is sometimes hypertrophied, not uniformly, but in patches; this effect, however, is by no means so well marked as is asserted by pathologists, and, in fact, is often entirely absent. Brownish, grayish, bluish, or dark slate-colored spots, are frequently observable in this affection, and might be mistaken by the young anatomist for gangrenous eschars; from which, however, they can be easily distinguished by their firmness, want of odor, and great extent, the whole peritoneum being occasionally marked with them. But we must not always expect to find the membrane discolored; for, in protracted cases, it is more common to witness the opposite state, the affected parts being unusually white and milky.

The *false membranes* of chronic peritonitis are often very thick, forming large masses of fibro-cellular substance, by which the abdominal viscera are agglutinated into one general mass. When these structures ulcerate, their ordinary color is a dirty green; but they may also present various shades of yellow, gray, and brown, especially when, as sometimes happens, they are much impregnated with blood. Occasionally these membranes do not become organized, but have a friable, rotten aspect. Masses of this description have been found from one to two inches thick, overspreading the whole peritoneum like a poultice of mashed carrots.

The plastic lymph which is thus poured out not only serves to agglutinate the abdominal viscera more or less firmly to each other and to the inclosing parietes, but it occasionally becomes the seat of *fistulous tracks*, having either the arrangement of a blind sac, or communicating at each extremity with the intestinal tube. In the only instance in which I have observed this condition, the canals were of an irregularly cylindrical shape, from two to four lines in diameter, and from two to nine inches in length. The course of all, five in number, was remarkably tortuous. The principal one extended in an oblique direction over the anterior surface of the small bowel, from the sigmoid flexure of the colon towards the right side of the abdomen; where, after a distance of six inches, it terminated in two branches, each three inches in length; one of which opened into the upper part of the jejunum, the other into the upper part of the duodenum. The internal surface of these channels was somewhat rough and fleecy, as if lined by a mucous membrane; their parietes were of a fibro-cartilaginous consistence and insensibly blended with the surrounding adventitious textures. At the time of making the examination, they all contained a small quantity of fecal matter, of the same nature as that found in the small and large intestines.

The manner in which these new channels are formed may be explained in one of two ways. In the first place, we may suppose that they are generated under the immediate influence of ulceration and perforation of the bowel. Under ordinary circumstances, the consequence of such an event would be an extravasation of fecal matter into the peritoneal sac, rapidly followed by fatal inflammation. But, in a case like that before us, no such occurrence, it is obvious, could possibly take place, owing to the manner in which the intestinal coils are tied together. Hence, when the bowel becomes perforated, its contents, instead of escaping into the abdominal cavity, find their way into the connecting adventitious substance, where they excite ulcerative action, and thus gradually generate passages of communication between different parts of the alimentary tube. What countenances this view is the fact that, in the interesting case which fell under my observation, there were numerous ulcers both in the small and large bowel, and that the new channels all opened into these reservoirs. The patient was about twenty-eight years of age, during the four last of which he had been harassed almost incessantly with griping diarrhœa, the relic, apparently, of a severe attack of Asiatic cholera, complicated with acute peritonitis. Latterly, whenever he took food, it would generally in a few minutes pass by the bowels, in the same state as that in which it was swallowed. All the abdominal viscera were firmly and inseparably matted together; and the caliber of the whole intestinal tube was contracted to nearly one-half the original volume. In different parts of its extent the new substance was studded with hard, grayish, miliary tubercles, distinctly encysted, and many of them as large as a common pea.

We may suppose, secondly, that these fistulous tracks are formed under the influence of purulent matter, poured out either simultaneously with the plastic lymph in which they are situated, or subsequently to the establishment of adhesions. The fluid which is thus accumulated, instead of being absorbed, or extravasated into the peritoneal sac, works its way into the neighboring intestinal coils, through which it finds a ready outlet. In proportion as the contents of the abscess are evacuated, fecal matter passes in and supplies their place; for the opening in the bowel, being prevented from closing up, remains permanently patulous. According to this theory, the ulceration of the intestinal tunic, it will be observed, is supposed to be consecutive to the formation of the fistulous tracks.

The *serum* in chronic peritonitis may be perfectly clear and limpid; more commonly, however, it is of a greenish tint, white or milky, and blended with purulent matter, or flakes of lymph, or both together. Occasionally we find it reddish, from the exhalation of blood. The accumulation of watery fluid is sometimes immense. Thus in a patient mentioned by Dr. Beall,[1] of Missouri, the amount of fluid, evacuated within a few years, was two hundred and seventy-five gallons and a half, the first fifteen operations yielding an average quantity of twenty quarts!

It is a singular fact that the water in ascites occasionally exerts such a degree of pressure upon the recto-vaginal portion of the peritoneal sac as to make the perineum bulge out in the form of a tumor. The swelling varies in size between an orange and a fœtal head, and is generally of an irregularly oval figure, like the urinary bladder: it fluctuates distinctly under the finger, and disappears temporarily on pressure. When large it is translucent, and projects forward so as to occlude the mouth of the vagina. The internal coat of the tumor is formed by the peritoneum, the external by the perineum, which is sometimes inverted.

---

[1] Western Journal of the Medical and Physical Sciences, vol. x. p. 343.

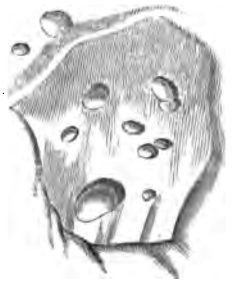
The matter which attends this disease, sometimes works its way along the spermatic cord, and points externally; at other times it escapes at the umbilicus, and instances occur in which it finds an outlet through the urethra. A person thus circumstanced may live a considerable period with a fistulous opening, or fatal inflammation may arise from the ingress of air.

Chronic peritonitis may exist as an intra-uterine disorder. The children are pale and emaciated, and thick, old membranes are found in the abdomen, agglutinating the viscera so firmly together that it is difficult to separate them. Even tubercles have been detected in several instances in children that have died within a few hours after birth.

3. *Gas.*—The peritoneum, like the pleura and pericardium, may contain air, or gas, either introduced from without, or generated within. Usually the affection coexists with serous fluid, blood, lymph, or purulent matter; and hence it has been supposed that the gas was the result rather of a chemical than of a vital process. Be this as it may, there is reason to believe that, when the accumulation is of a spontaneous nature, it is generally connected with inflammation, subacute or chronic, of the serous membrane. When the air is introduced from without it usually finds its way in from the alimentary tube through an ulcer or perforation, which may be small and difficult of detection. The quantity may be very trifling, or it may be so great as to cause severe suffering and even death. The gas is occasionally very offensive, from the presence of sulphuretted hydrogen, and escapes, when the abdomen is punctured, with a loud hissing noise.

4. *Cartilaginous and Osseous Concretions.*—(Fig. 222.) These bodies, although unfrequent, are occasionally found in the peritoneal cavity, accompanied or not by lesion of the abdominal and pelvic viscera. Generally loose and floating, they are sometimes attached by a sort of footstalk to the free surface of the serous membrane, and at other times inclosed in the subserous cellular tissue. In their form they are irregularly rounded, oblong, flattened, or ovoidal, and in their volume they vary from that of a pea to that of a small walnut. Smooth and polished externally, they are commonly composed of a mass of cartilage arranged around a bony nucleus; they are of a dull whitish, grayish, or pearly appearance, firm, compact, and occasionally, though not always, elastic. Their mode of formation is probably similar to that of interarticular bodies, to which they bear the greatest resemblance in their physical and chemical characters.

Fig. 222.



Cartilaginous and osseous concretions of the peritoneum. From a preparation in my cabinet.

5. *Tubercles.*—Tubercles of the peritoneum are sufficiently common, both upon its surface and in the substance of its false membranes. In their size these bodies vary from that of a clover-seed to that of a mustard-seed, currant, or even a pea; and they are often so numerous

as to cover nearly the whole peritoneum, thousands being visible in every direction, both on the visceral and parietal portions of the membrane. Occasionally we may see them in every stage of change, from the consistence of recent lymph to that of fibro-cartilage. In many cases they are confluent, like the pustules of smallpox, and have vessels shooting into them from the surrounding parts, which are highly vascular, as well as considerably thickened.

Although there is no part of the peritoneum which is entirely exempt from these heterologous bodies, yet they appear to be much more liable to occur in some situations than in others. In my own dissections, I have constantly found them more abundant, larger, and more distinctly developed, in the iliac and pelvic portions of the membrane than at any other points. They are also frequently seen on the mesentery, the omentum, and the serous coat of the spleen. In the early stage of their formation, they are so soft as to be easily wiped away; but they gradually increase in density, and may finally assume a cartilaginous, and even bony hardness. In some instances they have the consistence of putty, dry curds, or of semi-concrete mortar. The older ones are generally distinctly encysted, the enveloping membrane, which is very thin and delicate, being evidently of new formation; those, on the contrary, which are more recent, are unprovided with such a covering. In the generality of cases, they occur in scrofulous subjects, in connection with tubercles of the lungs, spleen, liver, and other organs. They almost invariably give rise to the signs of chronic peritonitis, of which they constitute a frequent form, so that, in addition to these heterologous deposits, exudations of lymph and serum with adhesions are met with.

6. *Carcinomatous Formations.*—The peritoneum is liable to the carcinomatous formations, especially the colloid and encephaloid. Of *scirrhus*, properly so called, I have never seen an example in this membrane, nor do I know that it has ever been observed by others, except as a secondary growth, extending to it from the adjoining structures.

Of *colloid cancer* of the peritoneum a remarkable case has been already described in the chapter on this disease, and an instance, hardly less extraordinary, came under my notice in the winter of 1854, in a gentleman, forty-five years of age, who was seen several times in consultation by my late colleague, Professor Flint, of Buffalo. The duration of the disease could not be accurately ascertained, but it probably extended over a period of upwards of two years, during the last of which the patient was nearly constantly confined to his bed. He finally died in a state of complete exhaustion. The peritoneal cavity was entirely obliterated, except at a small space over the right lobe of the liver; and was occupied by an enormous tumor, extending from the neck of the bladder to the diaphragm, which was pushed high up into the chest. All the abdominal and pelvic viscera were involved in it, but free from colloid disease. The convolutions of the bowel, large and small, were inclosed in and compressed by it; the stomach was in the same condition, and was much reduced in size. The spleen, pancreas, gall-bladder, the greater portion of the liver, and the urinary bladder, were surrounded by the tumor. The colloid structure of this immense mass was well characterized throughout, being composed of numerous cells, varying from the volume of a mustard-seed to that of a hazelnut, and occupied by a pale greenish, jelly-like substance.

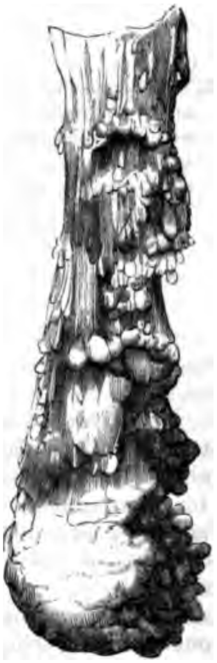
The most ordinary form in which *encephaloid* occurs is that of small tumors, from the size of a bean to that of an egg. Their shape is either spherical or pear-like, and their number is often quite great, from twenty to a hundred being found in the same individual. They are generally of a dull white color, mottled with dark spots, are surrounded by a very delicate yet distinct membrane, and are penetrated at different parts of their circumference by minute florid vessels, which thus supply them with blood. The contents of these tumors are subject to considerable variety; for, whilst some are composed almost wholly of cerebriform matter, others are made up of a soft grumous substance, or of a fluid closely resembling thin jelly or half-boiled arrowroot. On some occasions they are exceedingly vascular, exhibiting an appearance very much like that of the spleen. These heterologous growths are most frequently observed on the visceral portion of the peritoneum, and they generally coexist with similar formations in other parts of the body.

A huge encephaloid tumor of the peritoneum was sent to me, some years ago; by Dr. George E. Conant, of Huntington, Ohio, and is now contained in my private collection. It was taken from the body of a little girl, five years of age, and weighed eleven pounds nine ounces. It occupied the whole abdominal cavity, extending from the ensiform cartilage low down into the pelvis, concealing the small bowels, and adhering to the great omentum—from which it seemed to have originated—the uterus, the urinary bladder, and the parietal portion of the peritoneum. The tumor is of a whitish yellow color, lobulated, soft and doughy, with numerous vessels, of a large caliber, ramifying over its outer surface. Internally, it has a distinctly fibrous arrangement, and contains numerous little cells, some of which are filled with pus, some with a thin, turbid sanies, some with blood. This immense encephaloid mass could be easily felt through the abdomen during life, and its presence occasioned, especially towards the last, the most frightful dyspnœa, together with great emaciation and gradual exhaustion of the powers of the system.

*Melanosis* is sometimes found in the peritoneum, the form in which it is poured out being liable to considerable variety. It may occur as an infiltration in the connecting cellular tissue; but more commonly it is deposited upon the free surface of the serous membrane, and observes a punctiform, stratiform, or nodulated arrangement. The parts of the peritoneum most prone to melanosis are the great omentum and the epiploic appendages of the colon, from the predilection, probably, which this substance has for the adipose tissue. In the nodulated variety, the tumors, whether isolated or agglomerated, generally adhere by a broad base, and are sometimes enveloped by cysts of fine cellular tissue, furnished with delicate vessels. When occurring in layers this substance is covered by a thin film of membrane, and is liable to be confounded with common hemorrhagic effusions, altered in their color by the chemical action of certain acids and gases, developed either in the intestinal tube, or in the peritoneal cavity.

Finally, the *omentum*, a process of the peritoneum, is subject to various diseases, but the only one requiring any notice here is chronic enlargement, or hypertrophy. This affection is most common in old and large herniæ, attended with the protrusion and long retention of this membrane. Under such circumstances, the omentum is very liable to contract adhesions to the hernial sac, by which it is rendered ultimately irreducible; but in addition to this, it always becomes more or less enlarged from interstitial deposits, and ultimately entirely deprived of its primitive structure, being converted into a hard, dense, solid body, feeling more like a mass of fibrocartilage than a fold of peritoneum. Its surface, at this stage of the affection, is generally very rough, and tuberculated, as if it were inlaid with cherry-stones, or small pebbles; it is of a reddish, or yellowish color, and distinctly creaks under the knife. Cases occur in which the degenerated mass contains serous cysts, colloid, or fibrous nodules. A change in the form of the membrane is always a striking phenomenon in the morbid appearance. Instead of being spread out, so as to cover the abdominal viscera, as it does in the healthy state, it is always contracted in every direction, forming a mass, perhaps, hardly the volume of an adult's hand. On the other, it occasionally forms an immense tumor, literally filling the abdominal cavity, and imparting an appearance similar to that occasioned by an enlarged ovary, for which it has been known to be mistaken. A good specimen of such a mass is represented in the adjoining cut (Fig. 223), from Liston.

Fig. 223.



The omentum is liable to the heterologous formations, all of which may originate in it, and pursue the usual course.

# CHAPTER XXII.

## BILIARY APPARATUS.

I. *The Liver.*—Weight, Color, and Analysis.—Lesions.—Inflammation.—Suppuration and Abscess.—Gangrene.—Softening.—Induration.—Hypertrophy and Atrophy.—Cirrhosis.—Tubercles.—Carcinoma.—Melanosis.—Hydatids.—Adipose Transformation.—The Liver Fluke, and other Worms.—Cartilaginous Degeneration.—Osseous Concretions.—Sanguineous Effusions.—Erectile Tumor.—Restorative Powers of the Liver.—II. *The Gall-Bladder.* Inflammation.—Ulceration and Rupture.—Atrophy and Thickening of its Coats.—Diseases of the Biliary Ducts.—Alterations of the Bile.—Gall-stones.

## SECTION I.

### LIVER.

In its weight, the liver varies from two pounds and three-quarters to three pounds and a half; consequently, it may be said to constitute about the thirty-fifth part of the entire weight of the human frame. Its volume, however, is much influenced by the state of its own circulation; a circumstance which might be anticipated from the immense quantity of blood which is continually poured into it by the hepatic artery and portal vein. Of the extent of this influence, a good idea may be formed by removing the liver from the abdomen and washing out its fluids, when its bulk will be found to be considerably diminished, as is shown by its collapsed and wrinkled aspect. Nor is this all. Whatever has a tendency to retard, interrupt, or prevent the return of the blood from the hepatic veins to the right side of the heart, must induce congestion, with all its necessary evils, in the organ under consideration. Hence it is found that disease of the liver is often directly dependent upon lesion of the heart or large veins.

That the *color* of the liver should be modified, and, if I may so express myself, controlled by the amount of blood which it receives, no one can for a moment doubt. Accordingly, we find that in the fœtus, in which the liver is always remarkably vascular, the color is much more florid than some time after birth, or in the subsequent periods of life. In the adult, it is generally of a reddish-brown, with spots of blue, particularly along the anterior margin and under surface. In persons who are hung, the liver is usually of a deep pink color, and sometimes even quite purple.

In simple *congestion*, the hepatic tissue is generally of a florid red, the arteries and veins are preternaturally distended, and blood flows freely on making sections of it. By a careless observer this condition of the liver might be confounded with inflammation, but may be readily distinguished from it by the greater uniformity of its color, by its pervading the entire organ, and by the facility with which the blood may be squeezed from its vessels. It has been shown that, when the congestion results from the portal veins, the granules are the parts which are most vascular; whilst, when it is caused by the hepatic veins, it is most distinct in the intervening cellular tissue. When both systems are filled with blood, the redness will be equally conspicuous in both textures.

The human liver has been *analyzed* by different chemists, with the uniform result of detecting the presence of a certain quantity of fat. One of the latest examinations is by Mr. Beale,[1] of London, who, in two healthy subjects, obtained the subjoined results:—

| | I. | II. |
|---|---|---|
| Water . . . . . . . . . . . . . | 68.58 | 72.05 |
| Fatty matter . . . . . . . . . . . | 3.82 | 4.28 |
| Extractive, soluble in water and alcohol . . .<br>Extractive, soluble in water only, and albumen . | 10.07 | 10.40 |
| Alkaline and earthy salts . . . . . . . . | 1.50 | 1.19 |
| Matter insoluble in water, alcohol, and ether . . . . | 16.03 | 12.08 |
| | 100.00 | 100.00 |

A knowledge of the *situation* of the liver, in respect to the neighboring parts, is of no little importance in reference to the diagnosis of some of its structural lesions. Such information will also be in the highest degree useful, as enabling us to comprehend how an enlarged liver may compress the stomach and interrupt its functions; how it may produce jaundice, by impeding the flow of bile; or dropsy of the abdomen, by obstructing the return of the blood to the heart; and how abscesses, originally formed in the hepatic tissue, may burst into the surrounding organs.

The position of the liver is sometimes singularly altered, even although it may not have undergone any change in bulk. Thus, in hydrothorax, it may be prominently felt, not only in the epigastric region, where a part of it is naturally situated, but also in the umbilical and left hypochondriac. On the other hand, in copious ascitic effusions it may be forced so high up into the chest as to encroach seriously upon the right lung, producing atrophy of that viscus, and terrible dyspnœa. Sometimes, again, the liver is pushed over into the left hypochondriac region, by an encysted tumor, or by enlargement of the right kidney. All these facts should be borne in mind, as they have an important relation to the diagnosis of abdominal diseases.

The *lesions* which will be treated of in the present chapter, are, inflammation, suppuration, gangrene, softening, induration, hypertrophy and atrophy, tubercles, cancer, melanosis, hydatids, fatty degeneration, worms, cartilaginous and osseous concretions, apoplexy, erectile tumors, and laceration.

1. *Inflammation.*—Inflammation of the liver may involve either the proper substance of this organ or its investing membranes, and, like

---

[1] Budd on Diseases of the Liver, p. 279. Philadelphia, 1853.

the same disease in other organs of the body, it may be either acute or chronic. The acute form of the complaint is of rare occurrence in this country, but is sufficiently frequent in hot climates. In warm latitudes, there is always a high degree of nervous excitability of the chylopoietic viscera, and hence nothing is more common than to see a large proportion of the maladies of those regions characterized by a predominance of inflammation of the stomach, liver, bowels, or spleen. In our Southern States, almost all diseases assume a bilious type; but whether the liver labors under much irritation, or is merely sympathetically affected, are points which still remain undetermined. The term *congestive*, so much in vogue among the physicians of those regions, seems to me to be often used unmeaningly, certainly without a proper regard to the fundamental principles of pathology. That the internal organs, and especially the liver and spleen, are often inundated with blood in the intermittent and bilious fevers of those districts, may be readily supposed; but that this condition can last long without inflammation, is what very few will be willing to concede.

Inflammation of the liver occasionally assumes an epidemic type, affecting a considerable number of persons at the same time. An instance of this tendency occurred in 1828, in Dublin, where, prior to that period, acute hepatitis was looked upon as a very rare disease, a case being seldom met with more than once in a year or two, in the largest hospitals. At the date here specified, however, every institution of the kind in the Irish metropolis had a considerable number of individuals afflicted with it, and of these not a few died.

The anatomical characters of acute hepatitis vary according to the intensity of the irritative action, and the length of time it has been in operation. In general, the first perceptible effect is an increase of the vascularity of the parenchymatous structure, which becomes engorged in circumscribed spots, of a light red color. The part affected is somewhat tumid, and bleeds freely on being incised, but is not changed in its consistence; the hepatic canals are distended with a viscid, yellow, brownish fluid; and the acini are of a florid tint, and increased in size, though sometimes the reverse is the case, these bodies being much less distinct than natural.

In a more advanced stage, in addition to the vascularity, the hepatic structure becomes singularly softened, so that it may be reduced, by the slightest pressure of the finger, to a mere pultaceous mass. This state is analogous to the second stage of acute pneumonitis, and may, like it, be accompanied by the formation of pus, or a deposit of lymph upon the serous surface. In this respect, however, there is a wide difference between the liver and the lung, as we seldom meet with inflammation of the substance of the latter without pleuritis, while the reverse often obtains in acute hepatitis.

In its transition from the first to the second stage, the inflammation often gives rise to various shades of color. Thus, the parenchyma may be of a deep red, disposed in arborescent lines; or the vessels may encircle the acini in the form of wreaths, freely anastomosing with each other. When the disease is very intense, it is not unusual to see a number of small ecchymoses, produced by a rupture of some of the capillary arteries or veins; and instances occur in which the affected part assumes a deep brownish, violet, or mottled aspect, the latter appearance being particularly liable to happen when the inflammation occurs in circumscribed spots. In such cases, the whole portal circle is gorged with black blood, the biliary ducts are deeply injected, and their contents, being of a sero-sanguinolent nature, have no longer the bitter taste and ropy feel which characterize healthy bile. The mucous coat of the duodenum, also, is more or less phlogosed, and the minute branches of the hepatic artery and portal vein no longer admit injecting matter.

It is not often that the whole of the liver is involved in acute inflammation: most commonly it is limited to its surfaces, its borders, or to some of its deep-seated parts. In the latter case, the disease sometimes escapes the attention of the examiner, owing to the normal aspect of the exterior of the organ. Hence the necessity, in all our investigations, of removing the liver from the abdomen, and cutting it into thin slices. In some cases, especially such as follow surgical operations, the hepatic and portal veins are inflamed; and instances occasionally occur in which they are filled with pus or fibrinous concretions.

When the inflammation is seated in the investing membranes, they exhibit the same appearances as the fibro-serous textures generally. Numerous vessels pervade them, passing up from the parenchymatous texture, and they are thicker and more opaque than in the healthy state. Lymph is also commonly deposited upon their outer surface, either in narrow bands, in small patches, or in considerable masses. The organ being thus glued to the neighboring parts, is often compressed, and much restrained in its movements. In some instances it is literally buried in lymph, and its adhesions being strong, much dissection is required to liberate it. The disease, however, is seldom thus extensive.

Acute hepatitis may terminate in resolution, the formation of matter, gangrene, or softening. Not unfrequently it passes into the chronic form, when it is liable to give rise to induration and other structural lesions. There is reason to believe that chronic hepatitis sometimes exists as a primitive affection; its invasion being very gradual, and unaccompanied by any severe symptoms. It is a much more frequent complaint, in this country, than the acute form; yet it is not so common, perhaps, as the term "liver disease," so generally used by the profession, would lead us to suppose. The anatomical characters of the disease may be collected from what we shall say concerning induration, hypertrophy, atrophy, and fatty degeneration of this organ.

2. *Abscess.*—Although suppuration of the liver occasionally follows chronic inflammation, yet this effect is much more frequently witnessed as the result of the acute variety of the disease. The pus may be diffused, occur in small points, or be collected into one or more abscesses. The number of these purulent deposits is often quite great, the liver being literally burrowed by them; sometimes they communicate together by narrow fistulous passages, but in most cases they are separated by considerable intervals, or by thin partitions of hepatic substance. Occasionally the abscess is of extraordinary size, occupy-

ing nearly the whole of one lobe, or the greater part of the organ. In this way quarts of matter are sometimes accumulated, and the hepatic textures are almost entirely wasted. When the quantity of fluid is great, or if it be long detained, even when small, it is apt to become encysted, the membrane by which it is inclosed, and which is susceptible of organization, varying in thickness from the fourth of a line to a quarter of an inch, and in consistence from the softness of lymph to the firmness of fibrous tissue. In other cases, especially in such as run a very rapid course, the matter lies in immediate contact with the hepatic tissue, which is itself usually in a state of purulent infiltration, or very much softened and altered in color.

The matter of a hepatic abscess usually partakes a good deal of the nature of true pus, being of a thick, white, cream-like appearance. Sometimes it is thin and sanious, sometimes thick and curdy, sometimes thin and brownish, like chocolate, and sometimes of the color and consistence of a decoction of unburnt coffee. In the generality of cases it is destitute of smell; but occasionally it is highly offensive and irritating. Now and then the fluid contains flakes of blood of a dark gray color; and instances occur in which it looks like the washings of flesh.

Suppuration of the liver does not always prove fatal. In many instances the matter has a tendency to discharge itself externally, or to force its way into some one of the adjacent organs. The principal circumstances which appear to influence the point of communication are the seat of the abscess and the general volume of the hepatic tumor. In the abdomen, the opening usually takes place in the peritoneal sac, the colon, duodenum, the stomach or gall-bladder; when the abscess points externally, the matter may find its way out at the epigastric region, the right loin, or between the false ribs, usually by a narrow, fistulous route. It is not improbable that the pus may sometimes pass into the bowels through the biliary ducts; and instances are mentioned in which it found an outlet through the right kidney. When the abscess is seated at the upper border or on the convex surface of the liver, it may break into the right side of the chest, where it either excites fatal inflammation, or it erodes the pulmonary tissue, and is finally discharged through the bronchial tubes, between the ribs, or even through the axilla. In one instance the matter was discharged into the vena cava. But the most extraordinary circumstance connected with this subject is, that the fluid sometimes works its way into the pericardium. Of this interesting cases have been reported by Mr. Knott, of India, Mr. Allen, of Mauritius, and by Professor Smith, of Baltimore. In the latter, the liver adhered closely to the upper part of the diaphragm, and was occupied by an enormous quantity of pus, about a quart of which had escaped into the pericardium. In a case detailed by Dr. Graves,[1] of Dublin, the abscess opened both into the pericardium and the stomach. When the matter is discharged, the abscess sometimes heals, the process being analogous to that which is observed under like circumstances in the lungs and other organs.

---

[1] Dublin Medical Journal, January, 1839.

Hepatic abscesses are very rare in the colder regions of this country, but sufficiently common in our southern latitudes. Some years ago there were, within the space of a few months, nearly a dozen cases of this disease, all from Louisiana, in the Louisville Marine Hospital. In Europe, abscesses of the liver are also extremely rare;[1] while in the East and West Indies they are very frequent.

In acute hepatitis, pus usually begins to be deposited in the course of six or eight days from the commencement of the attack; whereas, in chronic cases, months often elapse before the occurrence of this event.

Abscesses of the liver are liable to be produced by irritation of the lungs; and in many instances they supervene upon injuries of the head, large wounds, and surgical operations. The matter in these cases is supposed by some to be transmitted with the blood through the veins, from remote and diseased parts; but the more plausible opinion ascribes its origin to inflammatory irritation of the substance of the liver, brought on by some inscrutable sympathetic action. That matter may be thus conveyed is probable; but that it should create irritation in one organ in preference to another, is a point in pathology which cannot be very easily comprehended. If it has any truth at all, it forms merely an exception to the general rule. To admit that abscesses may be thus produced in any organ, is to admit that such an organ has an elective attraction for the purulent fluid that shall be flowing in the circulating mass; or, on the other hand, that its tissues are so close and peculiar, its capillaries so exceedingly fine, as to entangle the matter, and retain it forcibly in its interior. To me the hypothesis appears not only objectionable, but very absurd.

The mode of development of these *metastatic abscesses*, as they are denominated, is remarkably insidious, and is frequently connected with jaundice and phlebitis. Usually not larger than a hemp-seed, a pea, or a filbert, they are of an irregularly rounded shape, and much less perfectly circumscribed than when they are seated in the lungs. They may occupy any portion of the liver, but in most cases they are situated superficially; their number varies from one to several dozens, and their contents, which are commonly of a reddish, yellowish, or greenish color, are of a semi-concrete consistence, like that of a mass of fibrin. The hepatic tissue around these abscesses may be unaltered; but in general it is softened and preternaturally vascular. When they are seated superficially, the peritoneal covering is apt to participate in the morbid action. Commonly they succeed the original lesion on the tenth or twelfth day.

3. *Gangrene.*—The termination of acute hepatitis by gangrene is exceedingly rare. Baillie[2] never witnessed an instance of it, and Annesley, although for many years an inter-tropical practitioner, and constantly in the habit of making examinations, declares he has not

[1] Andral's Pathological Anatomy, vol. ii. p. 373.

[2] Morbid Anatomy, p. 136.

been more successful.[1] In several thousand dissections made by Andral,[2] this lesion occurred only in a single case. The mortified part is very soft and lacerable, extremely offensive, of a dark color, and pervaded with sanious fluid.

4. *Softening.*—Softening of the liver is a common and destructive affection in warm latitudes; but is very rare in the more temperate regions of America and Europe. That this is the case I am disposed to believe from my own experience, and from the few cases that are reported of this disease in our periodicals. The softening may present itself under two distinct forms, differing from each other both in their color and consistence, but resulting probably from the same cause, namely, inflammatory irritation. In the more common variety, which may be denominated *brownish softening*, the substance of the organ usually retains its normal color, but is broken down and friable, or has so far lost its cohesive properties that it readily yields to the force of the finger. In some instances, the affected part is infiltrated with thin, bloody, sanious, or puriform matter, and is converted into a soft, brittle mass, not unlike a rotten pear. When put in water, an immense number of small granules appear, resembling the seeds of a bunch of dried grapes: they are of a yellowish, brownish, or cinnamon color, and are attached to the large vessels by delicate vascular pedicles. In other cases, maceration produces an appearance like the washings of half putrid flesh, the water becoming discolored, and the part exhibiting multitudes of shreds, the remains, probably, of vessels and fibrous filaments. This variety of mollescence is generally most remarkable on the convex surface of the liver, and occurs almost always in combination with disease of the other viscera, especially of the stomach, spleen and lungs. It appears to be frequently met with in India, in persons who are rapidly carried off by cholera, dysentery, and malignant fevers.

The second species of softening has received the name of *black*, and, from its close resemblance to gangrene, is probably the result of a higher grade of inflammatory action, disorganizing the parenchymatous texture. It commonly invades a large extent of surface, sometimes, indeed, almost the whole organ, which it reduces to a dark pultaceous mass, having the consistence and aspect of grumous blood, or of a black, softened spleen. In some instances, the affected part emits a remarkably fetid odor; a circumstance which, together with its color, has given rise to the belief that the disease is analogous to, if not identical with, gangrene. The size of the liver is commonly diminished; it may, however, be perfectly natural, and occasionally it is considerably augmented.

Softening of the liver may run a rapidly fatal course, with symptoms of jaundice and of irritation of the brain. It is to this form that the term *yellow atrophy* of the liver has been applied. The organ is reduced in size and of an intensely yellow color. In the softened parts, complete destruction of the hepatic cells has occasionally been noticed.

---

[1] Diseases of India, vol. i. p. 435.

[2] Pathological Anatomy, vol. ii.

The causes of softening of the liver are not well understood; but that it depends upon inflammation, either acute or chronic, is indisputable.

5. *Induration.*—In induration the substance of the organ is unnaturally hard, firm, and dense, exhibiting, when torn, a singularly granulated surface. The volume of the gland may be unaltered, but in most cases it is much reduced, occasionally nearly one-half. The color varies in different instances, from a pale red to purple, nutmeg, brown, or lilac. A pale olive hue is sometimes met with. Induration commonly results from chronic inflammation, and is characterized by great thickening of the fibrous structure, and remarkable atrophy of the hepatic granules. In some cases, indeed, the granules seem to be entirely removed, their place being occupied by cellular tissue, very hard, and of a dull grayish color. The tunics of the liver usually participate in the condensation; the cellular substance accompanying the ramifications of the hepatic artery and portal vein is frequently indurated; and many of the excretory ducts are permanently obliterated, whilst others are thickened, and of almost gristly consistence.

The induration is not always partial: we frequently see it pervade the entire organ, though in the majority of cases it occurs in patches, or is limited to particular parts. The right lobe and lobule of Spigelius are perhaps more generally implicated than any other portions. Induration of the liver occurs in all cases of cirrhosis.

6. *Hypertrophy.*—Hypertrophy of the liver is a frequent affection, and in by far the greater number of cases, if indeed not all, it is combined with induration or softening. The color, size, and form of the liver in this affection vary infinitely, according to the period of its existence and the nature of the primary lesion. The most common tints are pale red, gray, brownish olive, dark green, mahogany, and nutmeg. These colors are frequently more or less blended, so as to impart a variegated appearance to the parenchymatous structure.

The hypertrophy may be limited to a single lobe, or it may occur in all of them at the same time; most commonly, however, it attacks the right side. The shape of the liver may be variously affected; and the surface of the organ is frequently very rough, granulated, furrowed, notched, or mammillated.

Hypertrophy of the liver results from slow and protracted inflammation. It is very common in young strumous subjects, in habitual drunkards, and in those whose constitution has been tainted by syphilis. The enlargement in these scrofulous livers would seem to arise from a deposition of albuminous material within the lobules. The liver is tough and of a light hue. A section is smooth and homogeneous, resembling bacon, whence it has been termed by some the *lardaceous* degeneration; whilst others, from its being almost uniformly an accompaniment of a scrofulous diathesis, have described this form of hypertrophy by the name of *scrofulous* enlargement of the liver.

7. *Atrophy.*—Atrophy of the liver is much less frequent than hyper-

been more successful.[1] In several thousand dissections made by Andral,[2] this lesion occurred only in a single case. The mortified part is very soft and lacerable, extremely offensive, of a dark color, and pervaded with sanious fluid.

4. *Softening.*—Softening of the liver is a common and destructive affection in warm latitudes; but is very rare in the more temperate regions of America and Europe. That this is the case I am disposed to believe from my own experience, and from the few cases that are reported of this disease in our periodicals. The softening may present itself under two distinct forms, differing from each other both in their color and consistence, but resulting probably from the same cause, namely, inflammatory irritation. In the more common variety, which may be denominated *brownish softening*, the substance of the organ usually retains its normal color, but is broken down and friable, or has so far lost its cohesive properties that it readily yields to the force of the finger. In some instances, the affected part is infiltrated with thin, bloody, sanious, or puriform matter, and is converted into a soft, brittle mass, not unlike a rotten pear. When put in water, an immense number of small granules appear, resembling the seeds of a bunch of dried grapes: they are of a yellowish, brownish, or cinnamon color, and are attached to the large vessels by delicate vascular pedicles. In other cases, maceration produces an appearance like the washings of half putrid flesh, the water becoming discolored, and the part exhibiting multitudes of shreds, the remains, probably, of vessels and fibrous filaments. This variety of mollescence is generally most remarkable on the convex surface of the liver, and occurs almost always in combination with disease of the other viscera, especially of the stomach, spleen and lungs. It appears to be frequently met with in India, in persons who are rapidly carried off by cholera, dysentery, and malignant fevers.

The second species of softening has received the name of *black*, and, from its close resemblance to gangrene, is probably the result of a higher grade of inflammatory action, disorganizing the parenchymatous texture. It commonly invades a large extent of surface, sometimes, indeed, almost the whole organ, which it reduces to a dark pultaceous mass, having the consistence and aspect of grumous blood, or of a black, softened spleen. In some instances, the affected part emits a remarkably fetid odor; a circumstance which, together with its color, has given rise to the belief that the disease is analogous to, if not identical with, gangrene. The size of the liver is commonly diminished; it may, however, be perfectly natural, and occasionally it is considerably augmented.

Softening of the liver may run a rapidly fatal course, with symptoms of jaundice and of irritation of the brain. It is to this form that the term *yellow atrophy* of the liver has been applied. The organ is reduced in size and of an intensely yellow color. In the softened parts, complete destruction of the hepatic cells has occasionally been noticed.

---

[1] Diseases of India, vol. i. p. 435.

[2] Pathological Anatomy, vol. ii.

The causes of softening of the liver are not well understood; but that it depends upon inflammation, either acute or chronic, is indisputable.

5. *Induration.*—In induration the substance of the organ is unnaturally hard, firm, and dense, exhibiting, when torn, a singularly granulated surface. The volume of the gland may be unaltered, but in most cases it is much reduced, occasionally nearly one-half. The color varies in different instances, from a pale red to purple, nutmeg, brown, or lilac. A pale olive hue is sometimes met with. Induration commonly results from chronic inflammation, and is characterized by great thickening of the fibrous structure, and remarkable atrophy of the hepatic granules. In some cases, indeed, the granules seem to be entirely removed, their place being occupied by cellular tissue, very hard, and of a dull grayish color. The tunics of the liver usually participate in the condensation; the cellular substance accompanying the ramifications of the hepatic artery and portal vein is frequently indurated; and many of the excretory ducts are permanently obliterated, whilst others are thickened, and of almost gristly consistence.

The induration is not always partial: we frequently see it pervade the entire organ, though in the majority of cases it occurs in patches, or is limited to particular parts. The right lobe and lobule of Spigelius are perhaps more generally implicated than any other portions. Induration of the liver occurs in all cases of cirrhosis.

6. *Hypertrophy.*—Hypertrophy of the liver is a frequent affection, and in by far the greater number of cases, if indeed not all, it is combined with induration or softening. The color, size, and form of the liver in this affection vary infinitely, according to the period of its existence and the nature of the primary lesion. The most common tints are pale red, gray, brownish olive, dark green, mahogany, and nutmeg. These colors are frequently more or less blended, so as to impart a variegated appearance to the parenchymatous structure.

The hypertrophy may be limited to a single lobe, or it may occur in all of them at the same time; most commonly, however, it attacks the right side. The shape of the liver may be variously affected; and the surface of the organ is frequently very rough, granulated, furrowed, notched, or mammillated.

Hypertrophy of the liver results from slow and protracted inflammation. It is very common in young strumous subjects, in habitual drunkards, and in those whose constitution has been tainted by syphilis. The enlargement in these scrofulous livers would seem to arise from a deposition of albuminous material within the lobules. The liver is tough and of a light hue. A section is smooth and homogeneous, resembling bacon, whence it has been termed by some the *lardaceous* degeneration; whilst others, from its being almost uniformly an accompaniment of a scrofulous diathesis, have described this form of hypertrophy by the name of *scrofulous* enlargement of the liver.

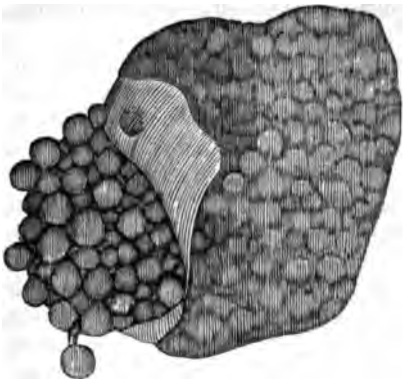
7. *Atrophy.*—Atrophy of the liver is much less frequent than hyper-

trophy, and usually occurs in union with induration or mollescence. It often affects the whole organ; but it is much more common to find it limited to one of its lobes, and, what is rather paradoxical, the liver may not only be of its natural dimensions, but even enlarged. In speaking of induration, mention was made of the fact that the granular structure is sometimes entirely absorbed and replaced by dense cellular substance. In this case, although there may be no diminution of bulk, there is yet an actual wasting of the hepatic tissue, the part affected being reduced, as it were, to its primordial framework. The color of an atrophied liver presents every variety of shade, from grayish-white to light brown or cinnamon.

This state of the liver often occurs in persons who are in the constant habit of using ardent spirits. It is rarely seen before the middle term of life, and is most common in old age. The hepatic vessels are always much diminished in size, and the functions of the organ more or less impaired. Its cause is manifestly chronic inflammation, producing an effusion of lymph and a partial absorption of the granular tissue. The atrophy is frequently connected with ascites, either as cause or effect.

8. *Cirrhosis.*—When the inflammation has its main seat in the fibrous structure of the liver, it leads to a deposition of albumino-fibrinous matter, which is transformed into fibrous tissue, and by contracting around the hepatic parenchyma gives to it that peculiar granulated appearance known as hob-nail liver or *cirrhosis.* The texture of the granulations is dense and compact, and exhibits a great variety of tints, being sometimes of a deep brownish red, sometimes of a tawny yellow, like beeswax, and not unfrequently of a pale cinnamon, pink, or lilac hue. When cut, they present a perfectly flat surface; and, if further examined, are found to be invested by a dense cellulo-fibrous capsule, of a light grayish color, from which they can be easily removed by dissection, their principal bond of connection being a small pedicle, through which they receive their supply of vessels, nerves, and absorbents. The size of the granulations is extremely variable, even in the same liver. In general, they do not exceed a garden pea, and frequently they are not larger than a currant or a hemp-seed. In one case I found many of the granulations as large as a hazel-nut, as seen in Fig. 225. The liver weighed five pounds and a half. In their shape these bodies are mostly spherical, or irregularly rounded; not a few, however, have a compressed, flattened, or angular appearance.

Fig. 224.

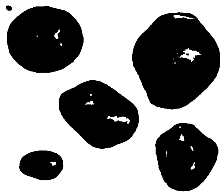


Cirrhosis of the liver. From a specimen in my collection.

Some of the granulations become hypertrophied, others atrophied.

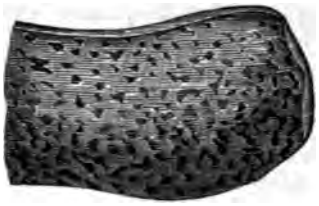
However this may be, they consist mainly of healthy liver parenchyma. The secretory cells are unaltered. The vessels, especially the smaller ones, are obliterated, which may account for the atrophy of some of the granulations, whilst others which escape the constriction and the diminution of their nervous and vascular supply, instead of becoming wasted, enlarge. What favors this view of the subject is that the hypertrophied acini are all furnished with separate footstalks, which are easily demonstrated by the knife, and which serve to convey to them the vessels, nerves and lymphatics, which exist in them in the natural state, and which are now more or less enlarged. The atrophied acini, on the contrary, have no such provision, or, at all events, only a very slight and imperfect one; as the disease advances their vessels are obliterated, and their whole substance finally disappears.

Fig. 225.



Hypertrophy of hepatic acini. From a preparation in my cabinet.

Fig. 226.



When these granules are very numerous, not large, and of a variegated brownish color, they give the liver a peculiar *nutmeg-like* appearance, as in Fig. 226. This state of the organ is most common in old dram-drinkers, as a result of repeated attacks of chronic irritation, or long-continued congestion. Indeed, whatever causes obstruction of the portal circle may give rise to it.

In whatever form cirrhosis occurs, the surface of the liver generally presents a singularly mammillated aspect, as if it were raised into a multitude of spherical eminences; the peritoneal coat is thickened, opaque, and wrinkled; and the volume of the organ is either diminished or augmented, seldom natural. In the former case, the hepatic texture is generally very dense, and almost destitute of moisture; in the latter, regarded by some as the first stage of the disease, it is usually somewhat soft, more or less vascular, and impregnated with a thin, bloody fluid, which can be easily squeezed out with the fingers. In both varieties, but more especially in the first, the hepatic tissue is often of a yellow tinge; and the bile being retained in the rootlets of the hepatic duct, exudes pretty freely on making sections of it. If, in this state, a portion of liver be macerated for ten or twelve days in water, the little granules will assume the appearance of adipocire, and may be easily washed out of their cellulo-fibrous capsules, leaving them in a soft, flocculent condition. In the advanced stages of cirrhosis, especially when there is great diminution with contraction of the liver, many of the vessels and ducts are obliterated, and the organ receives injecting matter with difficulty. Occasionally a collateral venous circulation is established by way of the diaphragm.

Cirrhosis, although occasionally met with in children and young persons, is most common between the thirtieth and fiftieth years. I have repeatedly seen it in very old subjects. It rarely exists by itself, but is almost constantly associated with organic disease of other parts of the body, particularly of the heart, kidneys, and lungs. The most common complication is chronic lesion of the heart, which is often present, and frequently attains such a degree of development as to render it probable that it had preceded, if not actually given rise to, the disease of the liver. The morbid alteration of the kidney, known as Bright's disease, is also of common occurrence. Cirrhosis very rarely exists in connection with tubercles of the lungs. The fatty degeneration of the liver, on the contrary, is a frequent complication of consumption. In the latter stages of the disease there is almost invariably ascites with anasarca, œdema of the lungs, hydrothorax, pericarditis, purulent effusion into the peritoneal cavity, pneumonia, pulmonary apoplexy, or intestinal hemorrhage. Occasionally several of these complications coexist.

9. *Fatty Degeneration.*—The liver is liable to the fatty degeneration, the new matter upon which this effect depends being either diffused through the whole organ, or limited to particular sections. The change is characterized by a pale yellowish, or light buff-color, by a diminution of consistence, and by an unctuous feel, the part perceptibly greasing the finger or scalpel, and yielding, on boiling, a brownish oily fluid, varying in quantity, in different specimens, from twenty to sixty per cent. of the entire mass. The oily matter, of which there is always a small quantity in the healthy liver, presents itself in the form of globules, of various sizes, which occupy the hepatic cells, distending their walls, and often obscuring their nuclei. Numerous globules, not inclosed in cells, are also seen under the microscope.

A fatty liver is always larger than a healthy one, and its edges are generally somewhat knobby or obtuse. Its surface frequently exhibits small brownish spots, streaks, or lines, which, from the manner in which they are arranged, give it a very singularly mottled appearance, not unlike that of the liver of the shark, cod, and other oily fishes. When a section is made, the interior is found to be of a much more uniform color, being of a pale yellow, deep orange, or light olive. The hepatic substance is always diminished in specific gravity, and its vessels, although compressed, and scarcely perceptible, still retain their normal structure, being perfectly permeable, and traceable to their minute divisions. The branches of the portal vein are engorged with black blood, and the excretory ducts contain unusually dark, fluid bile. The hepatic lobules are wasted, but the interstitial cellular tissue is remarkably distinct and abundant.

The fatty degeneration occurs most frequently in drunkards and phthisical subjects. It has also been observed in chronic affections of the lungs, heart, brain, kidney, and bowels, and in certain forms of cancer, as scirrhus and melanosis; but whether as cause or effect is still undetermined. It is more common in women than in men, and in the young than in the old. Indolence and huge feeding favor its development. Fatty degeneration of the liver has recently been described by several of our American pathologists as a constant lesion in yellow fever.

Various hypotheses have been offered with a view of accounting for this curious state of the liver; but the only explanation which seems to me to be at all tenable, is that which ascribes it to chronic inflammation, with venous engorgement, giving rise to an augmentation of the secretion of fatty matter, which is naturally contained in the organ, or to a fatty degeneration of the hepatic cells. This opinion derives support and illustration from what is observed in the inferior animals. In the goose and duck, an almost complete adipose transformation of the liver may be induced in a few weeks, simply by subjecting them to inactivity, withholding the light, and cramming their stomachs with paste made of barley-meal, mutton-suet, and coarse sugar, mixed with milk. This mode of fattening fowls has been pursued for many years in the neighborhood of London, and it has been found that if the repletion be kept up longer than a fortnight, so much structural lesion will be induced as to kill them, or render the meat unfit for the table, the liver being converted into a soft, red, oily mass. In the human subject, this change sometimes takes place very rapidly, as in the course of a week; and the organ is not unfrequently double the usual weight and bulk.

The bile is variously affected in this disease, being at one time very thin and pale, at another thick and dark-colored, at another greenish, olive, or brownish, viscid, and full of carbonaceous granules. The addition of almost any of the acids frequently produces an intolerable stench. The urine, too, is often sensibly changed in its properties, being commonly of low specific gravity, quite neutral, and accompanied by an unusual quantity of mucus.

10. *Change of Color.*—The liver is sometimes remarkably changed in its color. Thus, it may be of a light drab, milky-white, dusky-brown, nutmeg, yellowish-gray, amber-yellow, bronze, olive, slate, jet-black, or purple. The alteration may be general or partial, superficial or deep-seated, continuous or maculiform. A bluish, slate, or gray color is often present when the organ is apparently perfectly healthy. The livid or purple hue is most common in congestion of the portal circle; the different shades of drab and yellow, in the fatty degeneration; the black, in acute hepatitis of tropical climates; and the bronze, gray, and olive, in the remittent fever of the United States. Dr. Stewardson, formerly of this city, found this alteration so constantly in those who died of this disease under his care, that he is disposed to regard it as its essential anatomical characteristic. The color consisted of a mixture of gray and olive, bronze, or some shade of lead, which had entirely supplanted the reddish-brown, or left only faint traces of it. The alteration existed uniformly or nearly so throughout the whole extent of the organ, except in a single instance, in which a part of the left lobe retained its natural complexion. The liver was frequently enlarged, and its consistence generally diminished: the bile in the gall-bladder was abundant and perfectly fluid: the spleen was soft-

ened and enlarged in every instance. The discoloration described by Dr. Stewardson has been noticed by other observers; but the question is still unsettled whether it constitutes the distinctive anatomical feature of remittent fever.

Prof. Clark[1] ascribes the color in this fever to a deposit of pigment substance of varying shade and size. Some is of a transparent dark-brown, some red, orange, or jet-black. The coloring matter exists in the shape of globular particles, or in thin scales. The black pigment appears to be identical with the *melanine* described by Scherer and Robin. The adventitious matter is diffused through every part of the tissue; it occupies many of the secretory cells.

The color of the liver is very much altered in yellow fever. Dr. Chisholm, in his dissections in the West Indies, in 1793, found the organ of a color nearly approaching to buff, or a mixture of yellow and cineritious. The same appearance has since been noticed by Dr. Ruffz at Martinique. In the examinations of Louis at Gibraltar, the liver was invariably changed in its complexion. The most striking tints were those of fresh butter, straw, coffee and milk, mustard, orange, and buff. This alteration of color extended, in most cases, through the whole substance of the organ, although it was more prominent in the left than in the right lobe; and was associated with more or less anæmia and dryness of the hepatic tissue. Dr. Ashbel Smith, of Texas, found the liver of a light drab color, both externally and internally, in three cases out of seven. In one hundred and fourteen examinations by Dr. Dowler, of New Orleans, the organ was of a yellow, orange, lemon, straw, brass, gingerbread, or cork color in fifty-four; and in the remainder of the cases it presented various shades of yellow and milky, nutmeg and straw, brown and yellow, bronze and reddish, pale brown and mahogany, chocolate, mahogany and white, flaxseed, dark and greenish. It is to be regretted that this observer has not stated whether the discoloration noticed by him pervaded the entire organ, or was limited to particular parts of it. It has already been mentioned that the yellow color is presumed to depend on the fatty degeneration of the liver. The liver-cells are in many cases filled with oil-globules; but whether the degeneration of the liver is a constant and characteristic morbid change in yellow fever, has yet to be determined.

Dr. Charles Frick, of Baltimore, recently communicated to me the particulars of a case in which the whole interior of the liver was uniformly of a light apple or pea-green color, the outer surface of the organ being of a bronze hue, which also pervaded the entire skin. The patient, a man, aged twenty-five, had labored for a number of months under jaundice, and latterly, under ascites, hemorrhage, and black urine. The liver was cirrhosed, and one-third smaller than usual. Its fibrous structure was abnormally developed, and its lobular arrangement very clearly defined. Under the microscope the hepatic cells were found to be filled with the same coloring matter that was so conspicuous upon its cut surface. The gall-bladder contained about half an ounce of light green bile. The abdominal cavity was distended with serum, and the intestinal canal was filled with dark fluid blood. The kidneys were congested and somewhat enlarged, but otherwise sound. The supra-renal capsules were perfectly normal.

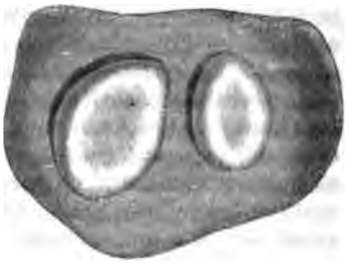
---

[1] La Roche on Yellow Fever, vol. i. p. 610, 1855.

11. *Heterologous Products.*—The liver is liable to *tubercles*, seated either in the substance of the organ, or scattered over its surface, giving it, in the latter case, a rough, mammillated appearance. Lying in close contact with each other, or separated, as the case may be, by large intervals, these bodies are generally of a rounded shape, and consist of an opaque yellowish substance, in various degrees of maturation. Their size, although sometimes not exceeding that of a mustard-seed, is usually considerable, many of them being as large as a cherry or even a hazel-nut. When the liver is thus tuberculated, it feels much harder than natural, and its vessels are compressed and sometimes greatly reduced in volume, though the organ itself rarely deviates much from the ordinary standard. In some cases, the tubercles bear a strong resemblance to those of the lungs: they have the same size, form, and consistence, but are a little browner in their color. They are always connected with a scrofulous diathesis, as is manifested by their frequent coexistence with pulmonary phthisis, and by their contents being usually of a curdy nature.

*Scirrhus* always occurs in distinct masses, the size, form, and consistence of which exhibit numerous diversities. The smallest are frequently not larger than a mustard-seed, but their volume may equal that of a chestnut, a walnut, or an orange. In a specimen in my private collection, the tumors, two in number, are about the size of a common apple: they are of a spherical form, hard, dense, gristly, and situated in the very centre of the organ. The masses sometimes lie close together, and, by their agglomeration, form a tumor equal in size to a fœtal head. These heterologous structures seldom occur singly. In the majority of cases, there are not less than six or eight; and I have seen instances where there were as many as two or three hundred.

Fig. 227.



Scirrhus of the liver. From a specimen in my collection.

In their form, these tumors are generally spherical; and those which project beyond the surface of the liver, for which they have a great predilection, have often a white-grayish dimple in their centre, produced probably by a condensation of the subserous cellular substance. The smallest, and those of recent formation, are of an opaque white appearance, and are intimately connected with the surrounding tissues; such, on the contrary, as are old, and of great magnitude, are often of a brownish color, with various shades of gray and black, and can be easily lifted from their situation. Vessels frequently shoot into them, sometimes so large that they can be filled with injecting matter:

they also no doubt receive nerves and absorbents, but their existence has not been demonstrated. To the touch they are hard and firm, like fibro-cartilage, the largest and densest yielding a slight creaking sound under the knife. The section generally displays a fibrous structure, the fibres radiating irregularly from the centre towards the circumference, like those of a turnip. In other cases, the tumor is lobulated and internally areolar, filaments of a grayish, brownish, or yellowish hue intersecting it in every possible direction. A white, milky juice may be obtained from them by pressure, and, in the cellular variety, a substance of the consistence and color of thin putty, paste, or concrete lard. Small masses of blood are sometimes diffused through them, but this occurrence is rare, except in such as are old, or in a declining state.

The hepatic substance in the immediate neighborhood of these bodies is, in most cases, perfectly sound; in others, it is indurated, softened, infiltrated with different kinds of matter, or partially absorbed. Hypertrophy of the liver is sometimes observed; but a much more common occurrence is an extreme reduction of its weight and bulk. When the tumors are numerous, the larger vessels are apt to be compressed; and, as a consequence, the organ is often exsanguineous. From the same cause may result obstruction of the hepatic duct, with retention of bile, and yellowish discoloration of the parenchymatous texture.

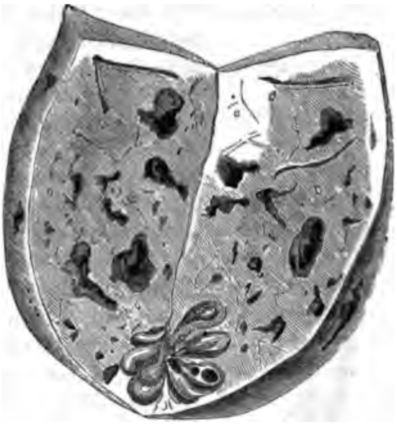
*Encephaloid* of the liver is occasionally observed, though, according to my observation, not so often as scirrhus, with which it probably has a similar origin. Like the preceding variety, this species of cancer occurs in various sized masses, of a grayish-white color, soft, compressible, and elastic, with considerable vascularity. They offer very little resistance to the knife, and are composed of an areolar meshwork, occupied by a soft, pulpy, brain-like substance, intermixed with fibrinous concretions, and dark-colored clots. The intersections are commonly of a lighter tissue, and, instead of being dense and thick, are eminently lax and delicate. Occasionally, though very rarely, the contents of these tumors are of the nature of hard jelly, constituting the *gelatiniform sarcoma* of some pathological anatomists, and the colloid cancer of others. The liver is sometimes much enlarged, and presents a mixed mass of disease—carcinomatous, encephaloid, and melanotic—in various stages of maturation. The encephaloid matter is occasionally deposited in the portal and hepatic veins, so as to exhibit a ramiform arrangement.

*Melanosis* of the liver exhibits the same characters as in the other organs. I have rarely seen this deposit in the human liver, but repeatedly in that of the ox, in which it is by no means uncommon, especially in the South-West of the Union. In a specimen in my cabinet there are a great number of melanotic masses, arranged in the form of encysted tumors, varying in size from a small pea to a walnut. (Fig. 228.) In man, the matter either assumes the tuberiform arrangement, or is diffused throughout the parenchymatous structure as an infiltration.

12. *Hydatids and Serous Cysts.*—Hydatids of the liver may oc-

cupy the interior of the organ, or stud its surfaces. They may occur at any period of life, although they are most usually witnessed in adults, and in persons who have been addicted to intemperate eating and drinking. Commonly of a globular shape, they are often closely clustered together, and are always contained in a cyst, formed of a dense, fibrous texture, and of a white, opaque appearance. In one of my cases the hydatids looked like spherical bags, the largest of which was about the size of an onion, whilst the smallest was hardly as big as a rifle-ball: their external tunic was dense, opaque, marked with numerous yellowish dots, and liberally supplied with vessels: their number did not exceed fifteen. The liver was much reduced in size, pale in color, and in many places so soft as to be unable to withstand the slightest pressure of the finger.

Fig. 228.



Melanosis of the liver. From a specimen in my collection.

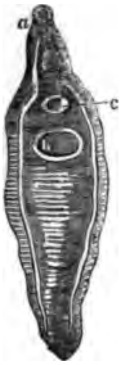
When these bodies are large or numerous, they may perforate the liver, and escape into the peritoneal cavity, as I witnessed in a man, thirty-five years of age, whom I attended along with Dr. Richards. The hydatids were of a dirty yellowish color, opaque, and from the size of a marble to that of a pullet's egg. They had been contained in a large sac in the right lobe of the liver, the anterior surface of which had given way, and thus permitted them to pass into the abdominal cavity, where they speedily excited fatal inflammation. In some instances they escape into the alimentary canal, and are discharged with the feces. In the human subject, there are no manifestations of the presence of these bodies during life, apart from those of chronic hepatitis. The disease may simulate ascites; and not a few cases are recorded in which the patient was actually tapped for this complaint.

These parasites are not peculiar to the human subject; they occur also in the inferior animals, especially in the ox, hog, and sheep. In these quadrupeds, the organ is sometimes completely crowded with them, immense numbers being everywhere scattered through its substance.

Less complicated in their structure than hydatids are those *serous cysts* which are sometimes observed on the surface of the liver, and which constitute what writers have described under the name of encysted dropsy. The walls of these vesicles are generally transparent, smooth, polished, and supplied with numerous vessels, of the finest texture and most beautiful arrangement. Their contents, which are thin and limpid, like the water of ascites, are coagulable by heat, alcohol, and acids. In some cases these tumors hang from the convex surface of the liver, in the form of globular bodies, about the volume of a walnut. Their most common size is that of a grape; but they may increase to a magnitude capable of holding many pints.

13. *Worms.*—The liver-fluke, the *distoma hepaticum* (Fig. 229), of helminthologists, although it has been several times seen in the human subject, is much more common in the inferior animals, as the sheep, horse, stag, and ox. It is also found in the gall-bladder; and Pallas mentions that he once detected it in the hepatic duct of a young female. Somewhat lanceolate in shape, it is of a yellowish color, obtuse at each extremity, and scarcely a fourth of an inch long by one line in breadth. It has two openings, one in front, which is directed obliquely inwards, and another behind and inferiorly, which is slightly prominent, and answers to the anus; the neck is rounded, and of a light brownish hue; the belly is marked by spots of an opaque dingy white. The worm is thought to have a distinct genital apparatus, with a vascular, and probably also a nervous system. In animals, it is often an inch long, by nearly half an inch in breadth.

Fig. 229.



*a.* The mouth; *b.* Suctorious disc; *c.* Generative orifice.

Worms sometimes crawl from the duodenum into the liver, where they have been known to create profuse suppuration, followed by fatal irritation. They generally belong to the lumbricoid species, and may be quite numerous, though ordinarily there is only a single one. They are always lodged in distinct pouches, communicating with the hepatic and choledoch ducts, the parietes of which are much dilated and perforated in every direction. The parenchymatous substance around is in a state of disease, and the whole organ is frequently considerably enlarged, as well as extensively adherent to the surrounding parts. Lumbricoid worms are more common in the inferior animals than in the human subject. In the liver of the hog I have repeatedly seen both the vessels and excretory ducts of that organ filled with them, and I have also sometimes met with them in dogs, especially old ones.

In examining, some years ago, the liver of a rat, I discovered a serous cyst, about the size of a small marble, on the under surface of the organ, which contained a tænia one foot in length by two lines in breadth. (Fig. 230.) The parasite was completely coiled up, and lived for upwards of an hour after its removal. The liver itself was perfectly sound. The specimen is preserved in my private collection.

14. *Transformations.*—Deposits of cartilage are sufficiently rare in this organ; most frequently they are confined to the investing membranes, occurring in small patches, of a soft texture and grayish color. The deposits are sometimes entirely *osseous*, being composed essentially of carbonate and phosphate of lime, with a small quantity of animal matter. The individual concretions are of irregular shape, of a whitish or yellowish color, and of variable dimensions, from that of an American dollar down to that of a five cent piece.

I have repeatedly met with very small *osseous concretions* (Fig. 231), in livers otherwise perfectly healthy. In one case there were altogether about fifteen, varying in volume from a mustard-seed to a currant. They were hard, somewhat gritty, of a yellowish hue, and most of them were distinctly encysted, the capsule, which was of a grayish color, and fibro-cartilaginous firmness, being from the sixth to the fourth of a line in thickness, and closely adherent to the surrounding tissues. In another case, the concretions were only five or six in number, the largest of which was about the size of a common pea. They were also encysted, but of a light brownish color, and of great hardness.

Fig. 230.

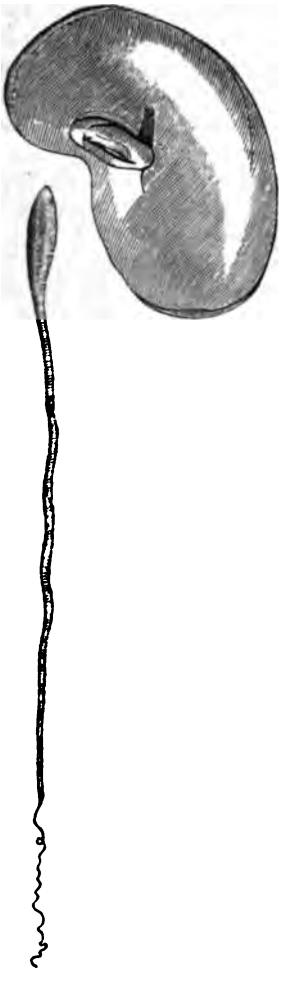
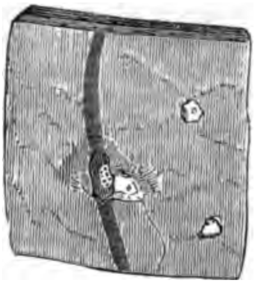


Fig. 231.



Osseous concretions of the liver. From a preparation in my collection.

How these little bodies originate, cannot be very easily determined. In one of the cases referred to, it seemed to me that they were nothing but tubercles in a state of osseous degeneration; a supposition which is favored by the fact that several of them, evidently less advanced than the rest, contained a minute quantity of curdy, friable matter. The individual, moreover, was of a decidedly scrofulous habit, and numerous tubercles existed in different organs.

15. *Hemorrhage.*—Blood sometimes escapes into the substance of the liver, constituting what is called *hepatic apoplexy.* It generally proceeds from one or more ruptured vessels distributed through the parenchymatous texture, and occurs in small spots, varying in density and color, according to the length of time they have existed, being always softer and darker the more recent they are. The disease is extremely rare, and is usually associated with other lesions.

16. *Erectile Tumors.*—Erectile tumors of the liver are of very rare occurrence, and have seldom been observed independently of the ex-

istence of other disease. Embedded in the substance of the organ, from which, however, they usually project upon its surface, they are of an irregularly rounded shape, and vary in size from that of a small marble to a walnut. They are composed of an areolar, spongy structure, the meshes of which are remarkably numerous, irregular in their form, and occupied by dark grumous blood, some being surrounded by a distinct fibrous envelop. A section of a mass of this kind bears the greatest possible resemblance to the cavernous body of the penis; whence the name of the disease. It is seldom we meet with more than one erectile tumor at a time.

17. *Laceration.*—Laceration of the liver is probably a much more frequent occurrence than is generally imagined. Only a few examples of it are, it is true, on record, but it is not unlikely that many happen which are never reported. The accident is always produced by external violence, as by a fall from a considerable height, or by the passage of the wheel of a carriage. It may take place without any mark of outward injury. In a great majority of cases, however, there is more or less contusion with ecchymosis of the skin, cellular tissue, and muscles, immediately over the affected organ. Along with this lesion there may be laceration of the spleen, intestines, kidney, and pancreas, with fracture of the cranium, ribs, sternum, spine, and other bones.

The number, extent, situation, and direction of the lacerations vary in different instances, and do not admit of any definite statement. I give the following case in illustration of the subject: John Shidaker, a stout, athletic German boatman, twenty-three years of age, was admitted into the Louisville Marine Hospital, June 29, 1844, for an attack of bilious remittent fever, under which he had labored for the last three days. On the 2d of July, in a paroxysm of delirium, he jumped over the portico upon the pavement below, a distance of fifteen feet, bruising the right hip, and wounding the forehead and right forearm. Death took place in about one hour after the injury. On examination, Dr. Pyles, the resident physican, who has furnished me with the particulars of the case, found the liver lacerated in not less than thirteen places. The largest rent, situated on the right lobe, towards its inferior margin, was rather more than six lines in depth, and ran in a crescentic direction for four inches from near the right border of the organ towards the left side. Two other fissures, both transverse, the one three, and the other two inches in length by eight lines in depth, existed above the preceding, together with two smaller, one of which looked more like a puncture than a laceration. The posterior surface presented eight rents, the largest of which, nearly three inches long, extended transversely across the organ, a little below its middle. The others ran in different directions, and, with the exception of two, were perfectly distinct from each other. None of these rents, either on the anterior or posterior surface, extended through the whole substance of the liver, which was somewhat enlarged, softened, and of a dark-bluish color. The gall-bladder was distended with a thick, dark, grumous, tar-like substance. The spleen, which was very much enlarged and extremely soft, was ruptured on its convex surface, and a part of its contents had escaped into the peritoneal sac. The right kidney was ecchymosed, and the small intestine extensively contused. The abdominal cavity contained upwards of eight pounds of fluid blood. None of the large vessels were injured. The brain and thoracic organs were healthy.

The quantity of blood poured out in laceration of the liver varies from several ounces to six or eight pounds. The accident is always fatal, the patient, if he do not die immediately, seldom surviving more than a few hours. To this statement, however, a remarkable exception is to be found in a case by Dr. Fazely, of Trinidad. The individual, a man, fifty years of age, survived the effects of the injury eight years, and finally died from a complication of disease. On examination, it was found that the right lobe of the liver had been ruptured throughout its whole length and thickness, from the anterior to the posterior part, and that the lacerated edges had perfectly reunited through the medium of a broad, thick cicatrice, of a hard, cartilaginous texture. In the interior of this cicatrice, at the depth of half an inch, a considerable cavity was seen, which communicated with the hepatic tissue, and contained about fifty biliary concretions. The surface of the liver adhered extensively to the walls of the abdomen. The gall-bladder was empty and flaccid, and the alimentary tube perfectly sound.

That such accidents are not so fatal as has been generally imagined, may be inferred from some experiments performed by Dr. Monro, of Edinburgh. He opened the abdomen of a living rabbit, and cut off one of the lobes of the liver. The divided vessels bled very profusely; but, by pressure, the hemorrhage entirely ceased in the course of three or four minutes. After the wound was sewed up, the animal appeared uneasy, but only for a short time, when it gradually recovered its spirits, and took food as before. During the five weeks that it was kept and closely watched by the experimenter, it was in perfect health, the digestion going on well, and the alvine evacuations being of the usual color, quantity, and consistence.

In another experiment, also performed upon a rabbit, the results were precisely similar. The animal lived upwards of twelve weeks, when it was killed. On examination, the cut surface of the liver was found firmly glued to the walls of the abdomen, by means of lymph. The results of these experiments are extremely interesting, as showing how large a portion of an organ, so important to life, may be ablated, and yet the animal perfectly recover.

## SECTION II.

### GALL-BLADDER.

I. *Inflammation* of the gall-bladder is characterized by the same structural phenomena as inflammation in other mucous tissues, and may be produced by various causes, of which the principal are the retention of irritating bile, the presence of gall-stones, and external violence. The disease, which may be acute or chronic, is often propagated from the duodenum along the cystic duct, and may lead to various consequences, as suppuration, ulceration, perforation, dilatation, or contraction, with hypertrophy or atrophy of its walls.

*Suppuration* of the gall-bladder is an occasional consequence of typhoid fever, dysentery, external injury, or the pressure of some morbid growth, as an enlarged pancreas, lymphatic ganglion, or scirrhous tumor. The pus is generally of a greenish tint, from the admixture of bile, and of a thin consistence, its quantity varying from a few drachms to half a pint or more. It often contains flakes of lymph and shreds of mucus; it is sometimes very fluid, sanious, and fetid. When the accumulation is considerable, and is attended with obstruction of the cystic duct, the enlarged reservoir extends beyond the margin of the liver, forming a considerable swelling, which may sometimes be felt across the walls of the abdomen. The organ is also apt, under such circumstances, to contract extensive adhesions to the surrounding parts, at the same time that its mucous tissue exhibits all the evidences of high inflammation. When the excretory duct is free, the matter generally escapes into the duodenum, and so passes off along with the feces.

*Ulceration* of the gall-bladder generally begins in the internal coat, being usually caused by the irritation of biliary calculi. In this manner extensive abrasions are sometimes produced, with hard, elevated edges; when there is obstruction of the cystic duct, the disorganizing process may implicate the other tunics, and finally lead to perforation and escape of the bile. The immediate effect of this accident is violent peritonitis, rapidly terminating in death. Perforation is most liable to happen from ulceration caused by the presence of biliary concretions, especially when they are very numerous, or when they block up the orifice of the excretory duct. The ulcers most frequently occur singly; but sometimes as many as six or eight small ones are found in the same case, giving the affected surface a peculiar sieve-like aspect.

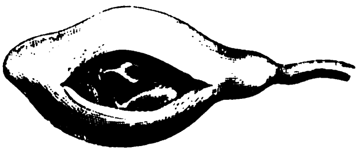
*Dilatation* of the gall-bladder is usually caused by obstruction of the cystic duct, and varies in degree from the slightest increase in the capacity of the reservoir to the most enormous distension. Thus Cruveilhier met with an instance where, in consequence of the compression of the choledoch duct by a mass of indurated absorbent glands, the organ was enlarged to the size of the urinary bladder. An equally astonishing case, in which it contained eight pounds of inspissated bile, is reported by Mr. Gibson, in the Edinburgh *Medical Essays.* When thus enlarged, the gall-bladder forms a pear-shaped tumor, which projects beyond the ribs, and sensibly fluctuates under the finger. A distended gall-bladder has been mistaken for a hepatic abscess; an opening has been made into it; bile has escaped instead of pus, and this, getting into the peritoneal sac, has speedily destroyed life.

The coats of the gall-bladder are liable to *œdema*, from the infiltration of their connecting cellular tissue by sero-albuminous matter. When the quantity of fluid is considerable, the organ exhibits a whitish gelatinoid appearance, not unlike a common oyster, from three to six lines in thickness. Dr. Dowler, of New Orleans, by whom this lesion was first accurately described, states that it is very common in that city, especially in persons dead of yellow fever. I have rarely met with it in any of my dissections. The gall-bladder is usually diminished in size, and contains a thin watery fluid, with hardly any trace of bile.

The parietes of the gall-bladder are sometimes *hypertrophied* by interstitial deposits, caused by chronic inflammation. The increase is generally most conspicuous in the cellular structure, but the different layers usually participate in it, and sometimes acquire an extraordinary degree of development, both as it respects their thickness and consistence.

The gall-bladder may be affected with *atrophy*, accompanied by partial or total obliteration of its cavity. The most common cause of the occurrence is closure of the cystic duct by calculi, destroying the office of the organ, and reducing it by degrees to a mere fibrous misshapen nodule, not as large, perhaps, as an almond. (Fig. 232.) In this condition the gall-bladder might be easily overlooked by a careless observer, thereby inducing the belief that it was entirely absent.

Fig. 232.



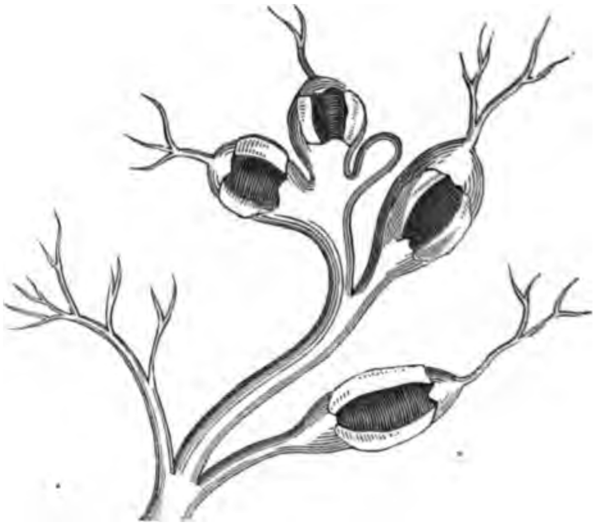
Atrophy of the gall-bladder, with several calculi in its interior. From a preparation in my collection.

The coats of the gall-bladder are subject to various *transformations*, as the fatty, fibrous, and osseous. Of these the first is the most common, and is met with chiefly in advanced life, in huge eaters, and in persons of indolent habits. It may affect the entire organ, or occur at particular situations, without any other appreciable change, and often exists with a similar state of the arteries. The fatty degeneration of the gall-bladder derives it chief interest from the circumstance that it is always attended with an abundant deposit of cholesterine upon the mucous surface of the organ, followed by a tendency to the formation of at least one variety of biliary concretion.

The fibrous and osseous transformations are occasional attendants upon protracted structural disease, resulting either in great wasting of the different tunics, or in their excessive expansion, in consequence of obstruction of the cystic duct. A deposit of earthy matter, chiefly phosphatic, is sometimes witnessed upon the inner surface of the gall-bladder, where it has been known to form a kind of shell, from a quarter of a line to a line in thickness, and covered by a thin film of bile and mucus. Finally, the gall-bladder may be *ruptured* as a consequence of external violence. The accident, which, however, is exceedingly rare, is usually accompanied by extensive mischief in other parts of the body. Falls from a height, the passage of a carriage-wheel, and severe blows upon the right hypogastric region, are the most common causes of it. In a case mentioned by Alberti, it was produced by a kick in a scuffle. Death may succeed immediately to the injury that occasions the laceration, or it may be postponed for a number of days and even weeks.

II. The *biliary ducts* are liable to the same lesions as the gall-bladder, in whose structure they participate. Thus they may be affected with inflammation, acute or chronic, softening, induration, ulceration, and perforation. In the latter case the bile escapes into the peritoneal sac, and induces disastrous results. The cystic duct is often obliterated and transformed into a dense, fibrous cord; similar lesions have occasionally been observed in the hepatic and choledoch ducts. The affection, however, I have reason to believe, is much more common in the former than in either of the latter of these tubes. Most generally the obliteration arises from the irritation of a gall-stone, or from the pressure of some tumor, as the head of an enlarged pancreas or a scirrhous lymphatic ganglion.

Fig. 233.



Dilatation of these tubes, caused by some obstacle to the egress of the bile, is a common occurrence. (Fig. 233.) Both the hepatic and choledoch ducts are often much enlarged: a case has been recorded where the latter of these passages was of the size of the duodenum.

"Instances of rupture of the biliary ducts are much rarer than those of rupture of the gall-bladder. M. Campaignac, however, has related a case in which a man, thirty-five years of age, who had received a violent blow from a carriage on the right hypochondrium, having died eighteen days after the accident, the left branch of the hepatic duct was found to exhibit, near the lobe of Spigelius, a longitudinal rupture, with unequal borders, capable of permitting the introduction of the end of the small finger. The abdomen contained six pints of a deep green fluid. The folds of the intestines were united to one another by a half organized false membrane, which lined also the anterior parietes of the abdomen, and other marks of inflammatory action were perceptible."[1]

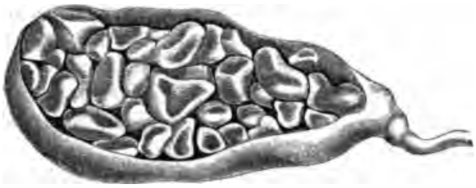
---

[1] Thomson, the Diseases of the Biliary Organs, p. 76. Phila., 1842.

III. Healthy *bile* is a greenish-yellow fluid, of a viscid, ropy consistence, readily miscible with water, of a peculiar sickening odor, and of a taste at first sweet, then bitter. From these normal states of the fluid, there may be numerous deviations, depending upon the condition of the liver, or the period of its retention in the gall-bladder. Thus it may be unnatural in its color, augmented or diminished in quantity, unusually acrid or bland, uncommonly thin or viscid. In some diseases it is of a deep black color, grayish, or almost white. The light tints are most common in cases of long-continued obstruction of the cystic duct, being attended with absorption of the coloring principles of the bile. In addition to these tints, there are often numerous intermediate shades of green, reddish, brown, orange, and yellow. In warm weather, the quantity of bile is generally much greater than in cold, and the fluid is also more acrid and stimulating, frequently inducing diarrhœa, cholera-morbus, and spasmodic colic. Its consistence may be as thin as water, or as thick as molasses, tar, mucilage, or half-dissolved glue. In the diseases of tropical climates the bile is sometimes so hard and viscid that it can scarcely be forced along the excretory ducts. It is especially dense in cholera, in which affection and in Bright's disease it has been found to contain urea. In organic maladies of the liver, it is occasionally of the color and consistence of coffee-grounds; in chronic hepatitis I have seen the gall-bladder distended with a thin reddish bile, not unlike the juice of the pokeberry. In some cases, if tasted, the fluid produces no particular inconvenience; in others, it is so acrid as to cause severe irritation. These abnormal states of the biliary fluid are always attended with important alterations in its chemical constitution. Simply changing the food, or modifying the blood, enables us to alter at pleasure the composition of the bile.

IV. *Gall-stones* may form in the ducts of the liver, but they most generally originate in the gall-bladder, where they are often accumulated in large numbers (Fig. 234). The greatest number I have ever seen in one case was three hundred and four. John Hunter examined a case in which there were above a thousand; and Morgagni refers to one in which there were three thousand six hundred and forty-six. When thus numerous, they are commonly very small, frequently not exceeding a bird-shot; under opposite circumstances, however, they often attain a considerable magnitude. The largest I have ever seen was about the size of a walnut. They usually lie loose in the gall-

Fig. 234.



Calculi in the gall-bladder. From a preparation in Dr. E. Wallace's possession.

bladder, but I have seen them occasionally encysted, and in one instance I found several of considerable size, situated beneath the mucous membrane in separate sacs.

Much diversity prevails in relation to the form and color of these concretions. When numerous, they are often perfectly smooth, and marked off into regular sides and angles, evidently occasioned by their mutual friction. In this manner they may assume various mathematical figures, as the tetrahedral and hexagonal. In the gall-bladder of a man of fifty, whom I examined in 1828, there were seventy-one of these six-sided concretions, none of which exceeded the dimensions of an ordinary pea; they were of a deep brown color, and emitted, on exposure to heat, a peculiar fragrant odor, not unlike frankincense. When there is only one gall-stone, it is usually of an oval shape, with a rough, grooved, or tuberculated surface. The principal colors of these concretions are brown, cinnamon, and black; with numerous intermediate shades, which it is difficult to indicate. Sometimes they are semi-transparent, and of a white pearly lustre: when they are formed in the substance of the liver, it is not unusual to find them of a dingy black, not unlike grumous blood.

Gall-stones often possess a considerable degree of solidity, and are commonly found to consist of a number of concentric laminæ, placed around a radiating nucleus. This central structure is frequently much softer than the exterior, and is generally made up entirely of inspissated bile and mucus.

The nature of these concretions has been investigated by numerous chemists. According to the analysis of Chevreul, gall-stones are mostly composed of the yellow coloring matter of the bile and cholesterine; the latter generally predominating, and, in many instances, forming the entire concretion.

Three varieties of gall-stones are usually described by chemists, the cholosteric, mellitic, and biliary. The first, as the name implies, is composed essentially of cholesterine; it is soft, smooth, and always of a polygonal shape, being generally composed of two tetrahedrons, applied base to base, with their edges and angles rounded off. The mellitic calculus, by far the most common of all, derives its name from its dark honey-like color. Externally it consists of thin, concentric layers of cholesterine, spread over a nucleus of indurated bile strongly resembling granulated honey. The third variety is very rare. It is made up entirely of inspissated bile, is of a yellowish cinnamon color, and of a semi-concrete consistence.

Gall-stones, instead of passing off by the bowels, or of remaining harmless tenants in the parts in which they are originally developed, as they usually do, may produce ulceration and perforation, followed by their escape into the peritoneal cavity; or, as occasionally happens, they work their way out through the walls of the abdomen. Of this mode of elimination I witnessed a remarkable case, in 1854, in a married lady, aged forty-one, whom I saw in consultation with my friend and former colleague, Professor Miller, of Louisville. She had suffered for se eral years from severe pain in the right hypochondriac region, preventing her from lying on her sides, especially the left, After some time, a hard, circumscribed swelling, about the size of an egg, appeared at the most tender part, and finally terminated in an abscess, which, breaking externally, was followed by the discharge of thirty-six biliary calculi, not all at once, but several at a time, the period required for the extrusion being upwards of two months. The precise point of opening was five inches from the median line, on a level with the umbilicus. The concretions were of a tetrahedral figure, perfectly smooth, of a dark cinnamon hue, and about the volume of a medium-sized cherry.

Gall-stones are more common between the ages of forty and fifty than at any other period of life. They are most frequently observed in persons of sedentary habits, and hence women are more subject to them than men. It is stated that in England five-sixths of all the cases of this affection occur in the female sex. Whether the proportion is equally great in this country, I am unable to say.

# CHAPTER XXIII.

## SPLEEN.

**Relations, Weight, and Size.—Acute Splenitis.—Anatomical Characters.—May pass into Suppuration or into Gangrene.—Softening.—Induration and Hepatization.—Hypertrophy and Atrophy.—Tubercles.—Calcareous Concretions.—Fibro-Cartilaginous and Osseous Matter.—Hydatids and Serous Cysts.—Sanguineous Deposits.—Laceration.**

THE spleen is in relation with a number of highly important organs upon all of which it must encroach, to a greater or less extent, when in a state of hypertrophy. In case of excessive enlargement, it might sensibly interfere with the motions of the diaphragm, and thus cause difficulty of respiration; with the stomach, and thus occasion indigestion; or with the colon and small bowels, producing displacement, together with difficulty of voiding the feces. The great vessels would also be apt to be compressed, and in this manner might result an unequal distribution of the blood, some of the viscera being surcharged, others sparingly supplied with it. Moreover, by interfering with the ready return of this fluid from the abdomen and pelvis to the heart, as must necessarily happen whenever there is an obstruction in the ascending hollow vein, ascites will be induced, generally of the most intractable kind. Naturally, the spleen is attached in a loose manner by vessels and peritoneal folds; but in certain states of disease, it is more or less firmly agglutinated to the circumjacent viscera.

The size of the spleen is subject to so much variety, even within the limits of health, as to render it impossible to lay down any definite rule concerning it. In the generality of cases, as I have satisfied myself by personal observation, it is about five inches in length by three in width, and one and a half in thickness; but from these dimensions there are frequent deviations. Thus I have often seen perfectly healthy spleens that were not more than three inches in length by two in breadth; and, on the other hand, some that were from seven to nine inches long. and from four to five inches wide. Not less variable is its weight. In the average number of cases, it does not exceed eight ounces; but in one instance, that of an adult male subject, I found it range as high as fourteen ounces; and in another, that of a full-grown female, as low as three and a half.

An additional spleen is occasionally found. This is more commonly the case, I believe, when the main organ is rather small. The greatest number of supernumerary spleens that I have ever seen was seven. Other writers have observed as many as ten, twelve, and even twenty. Of a rounded shape, they are about the volume of a nutmeg, and are usually situated in the gastro-splenic omentum, along the principal vascular trunks.

The lesions of the spleen may be comprised under the following heads: 1, inflammation; 2, suppuration; 3, gangrene; 4, softening; 5, induration; 6, hypertrophy; 7, atrophy; 8, tubercles; 9, melanosis; 10, calcareous deposits; 11, hydatids; 12, apoplexy.

1. *Inflammation.*—Inflammation of the spleen may be seated in its parenchymatous structure, or it may be limited to its envelops. In many cases the serous coat remains perfectly sound, but there are probably few in which the fibrous is not more or less implicated, either primarily or consecutively. Acute splenitis is a very rare disease, both in this country and in Europe; but very common in the East Indies, and often runs its course in a very short time. In the milder grades of the disease, or in the early stages of its attack, the substance of the organ is of a red brownish color, verging upon livid, gorged with grumous blood, and somewhat indurated. It tears with more facility than in the healthy state, and is considerably swelled, the congestion frequently extending to the great omentum, stomach, and liver. At a more advanced period the spleen is reduced to a soft blackish mass, not unlike half-dissolved blood: it exhibits a homogeneous aspect, and readily breaks under the pressure of the finger. In very violent cases, lasting several days, deposits of fibrin or globules of pus are not unfrequently disseminated through the disorganized structure, or collected into little depôts, which are either inclosed by a distinct sac, or surrounded by softened splenic substance. The peritoneal and fibrous coats are also more or less inflamed; and the organ is apt to become glued to the adjacent viscera, as the stomach, colon, and diaphragm, by masses of lymph. The splenic artery no longer admits injecting matter, and the splenic vein usually contains black grumous blood, mixed with pus. This phenomenon, however, is far from being constant.

2. *Suppuration.*—Suppuration of the spleen is a very rare occurrence. The pus, although frequently of the creamy kind, is sometimes hard and flaky, or thin and dark-colored, like coffee-grounds. In most cases, it is collected into a distinct sac, around which the parenchymatous structure is more or less softened, broken down, or altogether destroyed.

Occasionally the pus is infiltrated into the substance of the organ, or it presents itself in minute yellowish dots, intermixed with sanious matter. In quantity, it varies from a few ounces to several quarts. The coats of the spleen are almost always affected, and, together with the neighboring viscera, are covered with false membranes, which are sometimes perfectly organized. Cases occur in which the whole organ is converted into one great abscess, surrounded by a distinct pyogenic sac.

The matter may find its way into the peritoneal cavity, the stomach, colon, or small intestine; or it may burst through the intercostal spaces, the loins, or the walls of the abdomen. Occasionally the spleen contracts adhesions to the diaphragm, and the matter is discharged into the left side of the chest. In this way it may get into the lung, and be finally expelled by coughing.

I have seen but one case of abscess of the spleen. The patient was a young, robust farmer, who suffered immensely for a fortnight. The spleen gradually augmented in volume, and, at the expiration of this period, it projected over towards the umbilicus, forming a large rounded tumor, between the linea alba and the margin of the ribs. In a short time fluctuation was perceived, and, on introducing a trocar, about three pints of fetid, dark-colored matter issued from the incision. The wound was kept open for several days, by means of a tent; but in a short period it closed, and thence on, the patient's health began gradually to improve. The disease had supervened upon repeated attacks of intermittent fever, and was characterized by excessive irritability of the stomach, great pain and tenderness, and an impending sense of suffocation, caused, no doubt, by the pressure of the enlarged organ upon the diaphragm.

*Metastatic abscesses* of the spleen, consequent upon surgical operations and external injuries are of much rarer occurrence than in the lung, liver, and brain. They are also less numerous, but their volume is usually larger, and their contents resemble clots of blood interspersed with globules of pus. The tissues around the abscesses are usually inflamed, reddened, and softened.

3. *Gangrene.*—The termination of splenitis by gangrene is also very rare. Morgagni records only two examples of it, in both of which there was a similar lesion of the intestines. Modern authors, also, say very little upon the subject, and we have good reason to complain of the neglect with which it has hitherto been treated. The spleen, in this disease, is converted into a soft, diffluent mass, of a brownish, livid, or blackish color, and extremely offensive to the smell.

4. *Softening.*—A much more common effect of inflammatory irritation of the spleen, is softening of its substance, or a conversion of it into a dark-colored, bloody colluvies. The disease is a very frequent attendant on intermittent and typhoid fevers, chronic diarrhœa and dysentery, and affections of the brain and liver. In some countries it is occasionally epidemic. The regions most remarkable, in this respect, are the marshy districts of Italy, Bengal, Denmark, La Vendée, the island of Walcheren, and East Friesland. Animals are often affected with it; and it is asserted, though I do not know upon what ground,

that it is much more common in women than in men. In softening, the spleen may be enlarged or diminished, or it may retain its normal dimensions; its whole parenchymatous structure is broken down into a soft, blackish mass, not unlike grumous blood, thin tar, or currant jelly, surrounded by thickened and indurated coats. In the more aggravated forms of the complaint, the organ sometimes bursts spontaneously without any violence on the part of the patient, and the matter, escaping into the peritoneal cavity, induces fatal inflammation. Occasionally, however, the shell which incloses it is so strong as to prevent this. This was evidently the case with a spleen in my private collection, in which the parenchymatous structure, although perfectly softened, is surrounded by a layer of lymph at least one-fourth of an inch thick.

The cause of this disease is that of mollescence in general. Many pathologists attribute it to changes in the blood and in the nutrition of the organ; to me it seems to be produced by inflammatory irritation, breaking down the vascular and parenchymatous textures by a kind of molecular gangrene. This doctrine derives support from several circumstances. In the first place, it may be alleged that the softening does not occur all at once, but obtains its perfection by degrees. In the incipient stage of the disease, the spleen is merely injected with dark, dirty-looking blood, its reticulated structure being not as yet very materially altered. Indeed, it is not until the disorder has existed for some time that the organ assumes that black, tar-like aspect which characterizes the softening when it has reached its full development. The disease, secondly, is often accompanied by inflammation of some of the other viscera, and by severe pain in the left hypochondriac region, corresponding to the seat of the spleen. Finally, cases occur in which it coexists with disease of the lung, stomach, liver, pancreas, kidneys, and intestines.

In many of the subjects who died of the celebrated Walcheren fever, the spleen was greatly enlarged, often weighing from three to five pounds, and reduced to a mere bag, filled with a semifluid pulp, not unlike black currant jelly. In the malignant fever of Italy, Sardinia, Bengal, and Hungary, mollescence of this organ is a very common affection; and the same change is generally witnessed in ordinary typhoid fever. In forty-six dissections of the latter, Louis found the spleen softened in three-fourths, and in a fifth part of these to such an extent as to be reduced to a pulpy mass with the greatest ease. In the Egyptian plague, the viscus is generally softened, and double its natural volume.[1] In the remittent fever of Philadelphia, described by Dr. Gerhard and Dr. Stewardson, this alteration formed a constant and prominent feature. From all these facts, then, it may be justly concluded that mollescence of the spleen is uniformly dependent upon inflammation, sometimes of a high grade, but generally of a slow, chronic character.

Softening of the spleen, hardly ever observed at a very early period of life, is very common in middle and advanced age. Its progress is often very rapid, reaching its height in the course of four or five days. Occasionally it assumes a chronic form.

---

[1] Clot-Bey on the Plague in Egypt: British and Foreign Medical Review, vol. i. p. 248.

5. *Induration.*—The spleen is sometimes indurated. This change is generally associated with hypertrophy, and is probably occasioned by chronic irritation, giving rise to congestion of the capillary vessels, and to effusion of lymph into the reticulated texture. The spleen seldom retains its natural color; most commonly it is of a light brownish hue, tears with a granulated surface, and imparts to the finger the same solid feel as the substance of the liver. When these characters are present, the organ is said to be *hepatized;* a phenomenon frequently witnessed in this country, in persons who die from the effects of intermittent fever. Induration of the coats of the spleen will be spoken of in another paragraph.

6. *Hypertrophy.*—One of the most common affections of the spleen is hypertrophy, a state which I have observed in nearly three-fifths of all the examinations I have ever made. It generally occurs in connection with intermittent, remittent and typhoid fevers, and seems to depend chiefly upon mechanical congestion, exciting ultimately, perhaps, irritative action. That this is probable is proved by the fact that the spleen is usually more or less indurated, and otherwise changed in its structure. The enlargement is sometimes enormous. In many cases the organ is from ten to fifteen times the natural size; in an example recorded by Lieutaud, it weighed not less than thirty-three pounds. The patient was an aged female, in whom the hypertrophy had been gradually progressing for seventeen years. The hypertrophy is sometimes partial, occurring in the form of a tumor, from the size of a walnut to that of an orange.

The hypertrophy may be of a mixed character, some parts of the spleen exhibiting a healthy aspect, whilst others are indurated, broken down in texture, or in a state of suppuration. The coats of the organ are usually hardened, opaque, and thickened, either by interstitial effusion, or by deposits of lymph upon their surface.

Hypertrophy of the spleen is a very frequent, although by no means an invariable, accompaniment of the disease known as leucocythæmia, which consists in the presence in the circulating fluid of a large number of white corpuscles, and of a diminution of the red. The size of many of the white corpuscles is greater than in health. Some look upon the enlargement of the spleen as the cause of this alteration of the blood; but this view remains to be proved, for cases of leucocythæmia have been observed without any change in the viscus. The organ next most commonly affected is the liver; enlargement of the lymphatic glands is also frequently associated with this change in the constituents of the blood, sometimes with, sometimes without, simultaneous hypertrophy of the spleen.

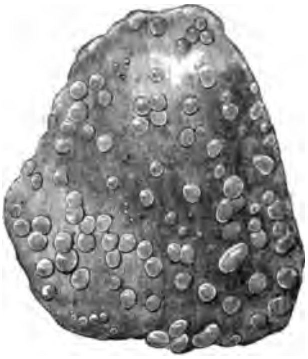
7. *Atrophy.*—Atrophy of the spleen is by no means so frequent as hypertrophy. Like the latter affection it varies in degree in different cases. The diminution in volume may be very slight, or so great as to give the organ the appearance of being almost annihilated. Professor Dunglison met with a case, not along ago, in which the spleen was re-

duced to the size of a small almond; Portal refers to one where it was not larger than a nutmeg; and Cruveilhier has seen it scarcely weigh a drachm. In a case which fell under my notice, it was hardly as large as a billiard-ball. It was of a grayish color, rounded in figure, indurated, almost bloodless, and weighed only one ounce, Both coats were thickened, and the internal was partially converted into cartilage. The patient, an old man of seventy-two, had died of tubercular phthisis. The atrophy is observed chiefly in connection with chronic affections of the alimentary tube, the liver, and kidneys, with ascites, and with profuse discharges of blood from different parts of the body. The lesion is sometimes partial, consisting apparently in a removal of the parenchymatous texture of the organ, leaving merely the original fibrous framework.

8. *Lardaceous Degeneration.*—An exudation of transparent amorphous matter may take place into the structure of the spleen, giving rise to what has been variously named waxy, lardaceous, or colloid degeneration. This deposit produces slight enlargement of the organ and an increase in consistency; a section exhibits a smooth, shining, but not vascular surface. The morbid material may have its main seat in the Malpighian corpuscles, and then the spleen has the appearance of having little grains of sago scattered through its substance. This peculiar condition of the spleen is for the most part found associated with Bright's disease, chronic dysentery, and scrofulous or lardaceous liver. The exact nature of the exudation is not clear. It has been found to afford the reaction of cellulose, being rapidly colored violet when treated with iodine and sulphuric acid.

9. *Tubercles.*—Tubercles are not uncommon in the spleen, either as a result of rapid or gradual development. I have seen them repeatedly in this organ in children, but rarely in the adult, and never in the very aged. In one instance, I met with them in an infant only a few months old; they were very small, solid, and so numerous that the organ was completely crowded with them. Tubercles of the spleen seldom occur in clusters, and, excepting in adults, they do not often acquire a great size. Occasionally, they soften, and form numerous small abscesses, filled with thick, curdy matter. These little bodies are not peculiar to the human spleen; they have been repeatedly found in the horse, monkey, and other animals. They seldom lead to fatal results. In most cases they exist at the same time in the lungs. When large and numerous, they are apt to excite inflammation in the neighboring portions of the peritoneum, leading to ascites. Fig. 235 is a beautiful representation of encysted tubercles of the spleen, from a specimen in my cabinet.

Fig. 235.



Tubercles of the spleen. From a preparation in my collection.

They are of large size, and of a pale yellowish color; some are partially softened, but most are in a crude state.

10. *Carcinoma* of this organ is exceedingly uncommon. In the many examinations I have made it has not fallen to my lot to meet with a solitary example of scirrhus, encephaloid, or colloid. In the case of general melanosis, described in the early part of the work, the spleen was free from that disease.

11. The spleen is not unfrequently the seat of *calcareous concretions*. They are always isolated, usually not larger than a grain of mustard, of a rounded shape, and of a whitish, or pale yellowish color. Their number is occasionally very great. In one case I counted upwards of fifty. The manner in which these bodies are formed is not well understood. My opinion, founded upon careful and repeated examination, is, that they are developed in the branches of the splenic vein; from which, as they increase in size, they gradually escape into the parenchymatous substance. This view is countenanced by the fact that they are often seen in different stages of their formation, as the fibrous, fibro-cartilaginous, cartilaginous, and osseous. The splenic tissue around these concretions is always unchanged.

There is a variety of osseous concretion of the spleen, which occasionally acquires a very large bulk. Its mode of origin is unknown. It is of a pale yellowish color, rounded, oval, or more or less angular in its shape, and either solid, or partly solid and partly porous. In one case a concretion of this kind weighed twenty-one drachms, and was arranged in concentric layers.

12. A very frequent affection of the spleen is a conversion of its tunics into a substance resembling *fibro-cartilage*, cartilage, or bone. The change generally begins on the convex surface, to which it either remains confined, or it gradually extends over the rest of the organ. The new substance commonly occurs in small, thin patches, separated by considerable intervals; but, in some instances, I have seen it quite thick, and spread over a large surface. This transformation is slow in its progress, and may affect one or both tunics.

13. *Hydatids* are occasionally found in the spleen. Their origin here is probably the same as in the liver, and they have hitherto been met with chiefly in persons of a cachectic constitution. The substance of the spleen immediately around these bodies is variously affected; in most cases it remains unaltered, but occasionally it is indurated, softened, and quite pulpy. The hydatids may be simply attached to the surface of the organ, grow between its tunics, or be developed in its parenchymatous structure. They are occasionally seen in the splenic veins, where they either float about, or adhere by delicate footstalks. Hydatids of the spleen cannot be diagnosticated during life. They occasionally attain a large size, and, by bursting into the abdomen, may cause death.

14. *Serous cysts* are sometimes met with in the spleen; they are generally of a globular shape, adhere to the surface of the organ by short, delicate pedicles, and contain a clear, limpid fluid, like spring-water. They rarely attain much bulk, and in some cases they are

occupied by a sort of meliceric, atheromatous, or steatomatous substance. Their mode of origin is very obscure.

15. The spleen may be affected with internal hemorrhage, so nearly resembling that of the brain that it may be designated by the term *apoplexy*. The blood is deposited at one or more points, commonly of a rounded shape, and of variable size, and is evidently the result of a laceration of some of the branches of the splenic vessels. When the hemorrhage is connected with softening of the organ, the fluid may accumulate in large clots, or it may burst the coverings of the spleen, and escape into the peritoneal sac. The changes which the apoplectic deposits exhibit are of the same nature as under similar circumstances in the brain and other organs.

16. The spleen, owing to its soft, brittle texture, is liable to *laceration* from external violence, as a blow, a kick, a fall, or the passage of a carriage-wheel. In such cases the individual usually expires in a short time from hemorrhage, or shock. Occasionally, indeed, death occurs in a few minutes, or almost instantaneously. The rent, which may be single or multiple, oblique, transverse, or longitudinal, often extends from one surface, one edge, or one extremity to the other, and when it involves the splenic artery or some of its primitive divisions, it is always followed by copious hemorrhage, amounting sometimes to many pounds. When the spleen is very soft and pulpy, it may be ruptured from the most trifling causes, as an inadvertent movement of the body, violent straining, or inordinate contraction of the abdominal muscles. Of this occurrence, which, however, is extremely rare, an instance was observed, in 1842, by Dr. John Neill,[1] of this city, in a black sailor, forty-two years of age. The spleen was of the natural form and shape, but exceedingly soft, and of a very dark color; the rupture was confined to the peritoneal covering, and the abdominal cavity was filled with blood, partly fluid and partly coagulated.

# CHAPTER XXIV.

## PANCREAS.

Is liable to pretty much the same Diseases as the Salivary Glands.—Rarely the seat of Acute Inflammation.—Atrophy.—Hypertrophy.—Is sometimes affected with Scirrhus.—Encephaloid.—Melanosis.—Fatty Transformation.—Serous Cysts.—Tubercular Deposits.—Sanguineous Effusion.—Earthy Concretions.

Excepting, perhaps, the thymus gland, there is perhaps no organ in the body which is less frequently diseased than the pancreas. This exemption is probably owing, certainly in part, to the singular structure of this viscus, to its concealed situation, and to the absence of everything like a proper envelop.

---

[1] American Journal of the Med. Sciences, N. S., vol. iv. p. 369.

1. Occasionally the pancreas is attacked with *inflammation*, originating either in its substance, or propagated to it from the surrounding organs, especially the duodenum, the lining membrane of which is reflected into its interior along the rootlets of its excretory duct. In the acute form of this disease, the pancreas is of a light reddish color, and the interlobular tissue is infiltrated with serosity, by which the glandular texture is rendered unusually distinct. When the inflammation is violent, the color becomes more deep, not unfrequently of a faint brownish or mahogany tint, and the proper substance of the organ undergoes such a degree of softening that it may be readily torn.

2. Although acute pancreatitis generally terminates in resolution, yet occasionally it passes into the chronic form, or leads to *suppuration*. The matter, as in the other viscera, may be diffused through the interlobular cellular tissue, or be collected into an abscess. In the former case, the pancreas is generally very soft, and of a reddish-gray color; in the latter, a portion of the organ is usually broken down, and the matter ultimately bursts into the adjacent reservoirs, as the stomach, colon, or duodenum. In some instances, it escapes into the cellular tissue of the mesocolon, where it is either absorbed or erodes the lamina of this fold, and makes its way into the abdominal cavity. In one case the abscess opened into the jejunum, the gland having been converted into a hard, reddish, friable mass, the interior of which was filled with drab-colored, fetid pus. I am not aware of any instance where the matter thus collected, discharged itself into the aorta or vena cava; but I can readily conceive of the possibility of such an occurrence. The fluid is sometimes contained in a strong pouch, formed by the surrounding cellular tissue, either alone, or aided by a deposition of fibrin.

There is considerable diversity in relation to the nature and consistence of the purulent matter. Most commonly it is thick, yellowish, and inodorous, as in healthy suppuration of other parts. In other cases, however, it is very thin, sanious, greenish, curdy, and highly offensive. The quantity of pus seldom exceeds a few ounces, though it may amount to several pounds.

Suppuration of the pancreas is not unfrequently associated with other diseases, as gout and rheumatism, intermittent and typhoid fever, chronic diarrhœa, dysentery, dropsy, and hepatitis. Occasionally it has supervened upon surgical operations and external violence. Anthony Petit observed several cases in which it followed the extirpation of the testicle and ligation of the spermatic cord.

3. Of *softening* of the pancreas very little is known. The lesion is very infrequent, and has been noticed chiefly in persons that have died of scurvy, smallpox, scrofula, and measles. It is characterized by loss of cohesion of the granular substance, and by inordinate humidity of the interlobular cellular tissue, with little or no change of color.

4. Acute pancreatitis has been known to terminate in *gangrene*; the occurrence is extremely rare, and I have never witnessed an instance of it. The event would, I suppose, be most likely to happen

from an extension of inflammation from the neighboring structures, or as a consequence of external injury. However induced, it is generally of limited extent, and is characterized by an increase of the normal color of the component tissues, by more or less softening, and by the exudation of a blackish fetid fluid on pressure.

5. *Chronic inflammation* is no doubt much more frequent than acute. Under the influence of this disorder, the pancreas becomes hard, firm, crisp, and of a dull reddish color, at the same time that it augments considerably in volume, from interstitial deposits. This increase of size, however, is far from being a constant phenomenon. Indeed, I am inclined to believe that, in very many cases, the organ experiences a real diminution, its lobules and granules becoming more closely aggregated than they are in the normal state. When the irritation is protracted, the pancreas often assumes a pale grayish aspect, and a hard, almost gristly, consistence.

6. *Atrophy* of the pancreas is most commonly induced by compression of some of the neighboring viscera, as an enlarged spleen, a scirrhous duodenum, or a hypertrophied liver. It may likewise be caused by enlargement of the right kidney, by a mass of diseased lymphatic ganglions, and by the pressure of a large aneurism of the ventral aorta. It might also result, I should suppose, from the contraction or partial obliteration of the splenic artery, interrupting the nutritive function of the component tissues of the organ. There is a species of atrophy in which the pancreas, in common with the salivary and other glandular viscera, loses its natural consistence, and is reduced in volume, as an effect purely of old age.

The color and consistence of the affected organ may be natural, diminished, or increased. In a majority of cases the color is quite pale, from the diminished supply of blood, and the granular texture is unusually firm, from the absence of serosity and the condensation of the connecting cellular substance. The extent of the atrophy is extremely variable. It may be limited to one-fourth, or one-half of the gland, or pervade the entire organ.

7. *Hypertrophy* of the pancreas is still more rare than a diminution of its bulk. The best examples that I have met with were connected with scirrhus of the pyloric extremity of the stomach, caused by an extension of the morbid action along the pancreatic duct. In one case the lesion was associated with great enlargement of the liver, while in another it was evidently dependent upon caries of the spine and ulceration of the intervertebral fibro-cartilages.

The increase of bulk is seldom very considerable, though the organ may be double, triple, or quadruple the natural size. The granular texture is remarkably close and firm, being intersected by opaque membranous bands, not unlike those of scirrhus. The connecting cellular substance is much condensed, and the gland is almost entirely deprived of moisture. The color may be natural, or augmented, but in most cases it is diminished, the enlarged part having a white, glossy appearance. When the hypertrophy, which is most common in the duodenal extremity of the pancreas, is considerable, the rootlets of the excretory duct are apt to be compressed by the indurated granules, leading to retention of the natural secretion, and to the formation of small cysts, filled with a turbid, viscid, reddish fluid.

8. *Scirrhus* of the pancreas may affect the entire gland, or be limited to particular sections of it, separated by parts which retain their normal structure and appearance. The portion most frequently implicated is the head or hepatic extremity. The diseased structure is usually of a whitish, grayish, or pale drab color, and of a dense, fibrous, or gristly consistence, emitting a grating noise when cut. In the more advanced stages, the granular texture is completely effaced, and the morbid mass is intersected by whitish or bluish bands, so characteristic of scirrhus in other glandular organs, as the mamma and testis. Now and then there is a singularly mixed state of disease, some parts being almost as hard as cartilage, others quite soft, or composed of alternate strata of white and yellowish matter.

This disease frequently coexists with scirrhus of other parts of the body, particularly the stomach, duodenum, and liver. The pancreas may retain its natural form and bulk, or it may, as in fact it generally is, be irregularly lobulated and enlarged. The increase of size varies from a few lines to several inches, and may be so great as to equal the volume of a large fist. When the disease is chiefly confined to the head of the pancreas, the enlarged part may compress the duodenum and choledoch duct, impeding the passage of the food, and the flow of the bile. The stomach and large vessels may also be injuriously encroached upon. When the common gall-duct is obliterated, and the biliary fluid retained, extensive disorganization of the liver may be the result. The pancreatic canal itself may remain pervious, or it may be closed, and rendered turgid from retained secretion.

When the patient survives the effects of this disease for several years, ulceration may take place, and thus a communication may be established between the tumor and some of the adjacent viscera, as the stomach, duodenum, or arch of the colon. In such cases life is sometimes destroyed, either suddenly or gradually, by hemorrhage from the perforation of a bloodvessel.

Scirrhus of this organ is most common in old subjects, though it has been observed as early as the thirtieth year, and, in one case, in a child, immediately after birth. Whether it occurs with equal frequency in both sexes has not been ascertained.

9. *Encephaloid* disease of the pancreas is very rare, especially as a primary affection. Although it has been noticed as early as the sixteenth year, it is most common after the age of forty, and, like scirrhus, may appear simultaneously or successively in other organs. The tumor varies in size from a cherry to that of a full-grown fœtal head, and exhibits the usual pale yellow, pulpy, and brain-like character of encephaloid in other situations. In the early stage of the disease the tuberoid nature of the tumor is well marked, but as the quantity of the heterologous matter increases, the pre-existing structures are changed, and ultimately entirely disappear. When ulceration occurs it pursues very much the same course as in scirrhus, that is, the erosive process extends to the stomach or bowels, and the patient is sometimes cut off by hemorrhage.

10. Of *melanosis* of the pancreas I have seen only one example, the subject being a man fifty-eight years of age, who had the same disease in nearly all the principal organs of the body. In the case alluded to the black matter existed in the form of small, hard, rounded nodules, with intervening healthy substance. Colloid of the pancreas is also very rare, and in the few examples of this formation which I have met with in the other organs of the body, it did not exist in this.

11. The extreme rarity of *tubercles* of the pancreas is well known. Rilliet and Barthez did not meet with them in a single instance out of 314 scrofulous children, nor was Louis more fortunate in his numerous dissections of phthisical subjects. I have witnessed the disease only in two of my examinations, once in a boy between eight and nine years of age, and once in a young man of twenty-two, both dead of pulmonary consumption. The deposit presented itself in the form of miliary bodies, of a firm consistence, and of a pale straw color, seated chiefly in the head of the organ, which was otherwise entirely sound. The heterologous matter occasionally occurs here as an infiltration.

12. Suety, atheromatous, and meliceric substances have been observed in the pancreas; and cases have occurred in which it had experienced the *fatty degeneration.* When thus affected, the organ is of a pale yellowish color, more or less soft, and indistinctly lobulated, and readily greases the scalpel. Its size is usually augmented, but its vessels are preternaturally small and brittle. This degeneration is rare, and the causes which give rise to it are still involved in obscurity.

13. *Serous cysts* are almost unknown in this organ. An instance is related by Bécourt in which a tumor of this kind, as large as the head of a child four years old, existed in its substance; it had very thick, fibrous walls, and was filled with a thin watery fluid. In a few instances the organ has contained acephalocysts. Storck, in his *Annus Medicus*, gives a case in which a pancreas, weighing thirteen pounds, was converted into a membranous sac, full of blood, partly fluid, and partly laminated and organized, as in an old aneurism. The probability is that this immense effusion was caused by the rupture of an enlarged vessel in the interior of the diseased gland.

14. The pancreas, from the firmness of its structure, and thickness of the parts by which it is covered, appears to be less liable to *laceration* from external violence than any other abdominal organ. The accident is always complicated with serious injury of other parts, as the liver, stomach, bowels, and ribs, and may therefore cause death in a very short time.

15. Finally, the *duct* of the pancreas, like that of the liver and gall-bladder, is liable to be choked up with tubercular matter, chalky powder, and earthy concretions. The latter vary in size between a small pea and a nutmeg, are of a whitish color, hard, friable, and of a spherical shape, with a rough, irregular surface. They are easily dissolved by muriatic acid, and are composed chiefly of carbonate of lime, in combination with a minute quantity of animal matter. The number of these concretions is sometimes considerable, as many as a dozen having been found in a single subject.

# CHAPTER XXV.

## URINARY APPARATUS.

**I. *Supra-renal Capsules.*—II. *The Kidneys.*—Observations on their Congenital Vices.—Lesions of their Fibrous Covering.—Pyelitis, Acute and Chronic.—Nephritis, Acute and Chronic.—Abscesses.—Softening.—Induration.—Gangrene seldom or never observed.—Bright's Disease.—Scirrhus and Encephaloid.—Tubercles.—Melanosis.—Erectile Tissues.—Serous Cysts.—Hydatids.—Fibro-Cartilaginous, Osseous, and Fatty Degenerations.—Enlargement and Atrophy.—Rupture.—Renal Calculi.—The Strongylus.—III. *The Ureter.*—Liable to Deposits of Tubercular Matter.—Effusion of Lymph, Thickening and Attenuation of its Parietes, with Contraction or Enlargement of its Cavity.—IV. *The Urinary Bladder.*—Is rarely affected with acute Inflammation, Suppuration, Softening, or Gangrene.—Hypertrophy of the Mucous and Muscular Tunics.—Developments of Cysts.—Ulceration.—Encephaloid Disease.—Tubercle.—Neuralgia.—Rupture.—Worms.—Morbid Urine.—Urinary Deposits.—Calculous Concretions.—V. *The Prostate Gland.*—Is liable to various forms of Disease.—Inflammatory Abscess, Chronic Enlargement, Tubercles, Melanosis, Encephaloid, and Calculi.**

## SECTION I.

### SUPRA-RENAL CAPSULES.

THE supra-renal capsule, situated at the upper extremity of the kidney, is seldom found diseased. In the adult it is always much smaller, relatively speaking, than in the infant, in whom it probably performs a very important function, though what that function is we are still ignorant of. As life advances, this body gradually diminishes in size, becomes indurated, brittle, and assumes a peculiar dark color. These changes, which are frequently noticed in young persons, are generally very conspicuous in old age. The atrophy is sometimes very great, the organ scarcely retaining a vestige of its original shape and structure.

Since the attention of the profession has been especially called by Dr. Addison to the diseases of the supra-renal capsules, several cases have been brought together in which the structure of these organs has been completely destroyed. Highly interesting cases of this kind are mentioned by Dr. Addison[1] himself, in his valuable monograph, by Mr. Hutchinson,[2] and by Dr. Taylor.[3] One of the most interesting results of this inquiry has been to establish the fact that a discoloration of the skin, of a bronzed hue, with anæmia, and great languor and debility, are symptoms which permit, during life, the diagnosis of disease of these organs. Whether all affections of the supra-renal capsules give rise in any degree to these symptoms or not, is not yet ascertained; but as these bodies will now be more carefully examined, we may soon expect not only to have this question settled, but also to learn much with regard to their physiology as well as diseases.

---

[1] On the Constitutional and Local Effects of Diseases of the Supra-Renal Capsules, London, 1856.

[2] Med. Times and Gazette, No. 297 and 299, 1856.

[3] New York Journal of Medicine, Sept. 1856.

The supra-renal capsule is subject to *inflammation*, but the changes induced by this disease have not been sufficiently studied to enable us to trace its history. In a few instances, I have seen it very red, injected, and softened, without, however, being able to satisfy myself that it was inflamed. The disease, I suppose, rarely exists independently; in most cases, it is no doubt propagated to it from the kidney or some other organ.

*Abscesses* have been known to form in this viscus. Blasius[1] mentions the case of a woman, fifty years of age, in whom the left supra-renal capsule was as large as a fist, soft, reddish, and filled with black purulent matter, mixed with sand and gravel; and Lieutaud[2] has recorded an instance in which this organ contained two pounds of pus.

The supra-renal capsule is liable, in common with other organs, as the heart and liver, to the *fatty degeneration*. The abnormal deposit occupies the granular cells, and occurs either in a crystalline form, or in the form of globules. The affected gland is of a brownish, pale yellowish, or cinnamon color, of a soft, doughy consistence, and variously altered in shape and size.

*Hemorrhage* of this body is uncommon, especially as a simple, uncomplicated affection. The blood, which varies in quantity from a few drachms to several ounces, is red and fluid, black and coagulated, yellowish and firm, according to the length of time that has elapsed since it was effused, and is generally contained in one or more pouches, the walls of which are often quite tough and thick. The hemorrhage may occur at any period of life. It has been noticed in new-born infants, and in persons after the sixtieth year.

*Earthy concretions* have occasionally occurred in the supra-renal capsule; and in a few rare instances it has been observed to be changed into a substance like cartilage.

Of *tubercles* of this organ, only two cases have come under my notice. In one of these, a young man twenty-seven years of age, the right supra-renal capsule was remarkably hard, dense, of a grayish mottled aspect, and filled with concrete tubercles, many of which were quite large. The left capsule was of a light slate color, and likewise contained several scrofulous deposits.[3] In the other instance, that of a child of fifteen months, the formation was connected with pulmonary phthisis, and consisted of a large yellowish mass, of the consistence of soft putty. In both these cases, the affected organs appeared to be of the natural size.

---

[1] Observ. Anat., p. 129.

[2] Hist. Anat. Med., t. i. p. 357.

[3] See Western Journal of the Medical and Physical Sciences, vol. xi. p. 21.

Of *scirrhus* of this organ no instance has ever fallen under my observation, and I therefore infer that its occurrence is extremely rare. In the case of a man, aged fifty-eight, I found both capsules very much enlarged, changed in shape, and filled with melanotic matter, which existed at the same time in most of the other viscera of the body. The deposit may show itself here, as elsewhere, either as an infiltration or in the form of little tubercles, from the size of a millet-seed to that of a filbert. Encephaloid of the supra-renal capsule is also very infrequent; and, as to colloid, I do not know that it has ever been observed here.

---

## SECTION II.

### KIDNEYS.

I. *Fibrous Covering of the Kidney.*—The fibrous capsule of the kidney is seldom implicated in disease. Acute inflammation is very uncommon; so much so, indeed, that in several hundred dissections I have never witnessed an instance. The reason why it so seldom occurs in this structure, probably is that it has no connection with the peritoneum, as is the case, for example, with the spleen and liver, the envelops of which are, as is well known, very prone to inflammation. Another reason, no doubt, is the fact that this membrane sends no processes into the glandular structure of the organ, the attachment between it and the outer surface of the kidney being effected by very short cellular tissue, which, we may suppose, rather prevents than admits of the propagation of diseased action from the one to the other. When inflamed, this membrane exhibits the same anatomical characters as other fibrous structures.

In tubercular and scirrhous disease of the kidney, I have found the fibrous capsule very much thickened, opaque, preternaturally strong, and covered with patches of organized lymph. In the fatty degeneration, it is sometimes remarkably attenuated, and hangs almost loose around the organ, from the destruction of the connecting cellular tissue. It is occasionally partly ossified; and cases are seen where it is converted into a substance like cartilage. Not unfrequently it is glued to the surrounding organs by thick masses of lymph.

II. *Mucous Lining of the Kidney.*—When the inflammation attacks the mucous membrane of the pelvis and calyces, it constitutes what is called *pyelitis*. This occurs at different periods of life, is induced by various causes, and is frequently associated with an albuminous state of the urine. It may affect the entire pelvis, or be limited to a particular part of it, or even to a single calyx. The disease may exist simultaneously in both kidneys.

The anatomical characters of acute pyelitis are increased vascularity, effusion of lymph or pus, opacity, softening, and alteration of the natural secretion.

In the milder grades of the disease the vascularity of the mucous membrane is of an arborescent character; but as the morbid action advances, the vessels exhibit a capilliform arrangement, and are so much distended as to give the part a tumid appearance. The discoloration varies from the slightest rose to the deepest purple, and is always in direct proportion to the intensity of the inflammation. Although it is sometimes spread over a considerable extent, it usually occurs in small, irregular patches, separated by narrow strips of sound membrane. In their size these patches range from a split pea to a dime; in their form they may be circular, oval, linear, or angular. When the inflammation is very high, the redness may not only be very intense, but is apt to be widely diffused. Minute spots, not larger generally than the head of a pin or a hempseed, are often observed, either in the substance of the membrane or in the submucous cellular tissue; they are evidently produced by the rupture of the capillary vessels, and constitute so many real ecchymoses. Connected with this augmented vascularity are, more or less opacity, softening, and deposition of lymph, in small, whitish, circumscribed spots, or in the form of a distinct lamella moulded to the shape of the cavity in which it is located. When the disease extends to the parenchymatous structure, it is not unusual to find serosity or pus in the submucous cellular substance. Ulceration, gangrene, and perforation are exceedingly infrequent.

When the morbid action is severe, the urine contained in the pelvis and calyces is invariably mingled with muco-purulent matter, pure pus, or pure blood. The presence of these adventitious fluids is not always visible to the naked eye, but may be easily detected with the microscope.

In *chronic pyelitis*, the mucous membrane is of a grayish, dull-white, mottled, brownish, light slate, or pale mahogany tint, or entirely free from discoloration of any kind. It is opaque, thicker, and tougher than in the healthy state, rough, and incrusted with plastic lymph, firmly adherent to the surface on which it rests. In protracted cases, the excretory tubes are more or less dilated, and the veins on the surface of the kidney are enlarged, tortuous, and so arranged as to form a network. The kidney itself may be of the natural size, or it may be increased or diminished. Ulceration of the mucous membrane is infrequent, and when it does occur it rarely leads to perforation. When the effusion of lymph is very great, it may produce partial obliteration of the excretory passages, and so embarrass the flow of urine.

III. *Parenchyma of the Kidney.*—The renal parenchyma itself is comparatively seldom diseased, which is surprising when we consider the great activity of its functions, and the facility with which its secretions are modified by the most trifling deviations from health. The principal affections of this gland may be referred to inflammation, suppuration, softening, induration, fatty degeneration, scirrhus, encephaloid, tubercles, serous cysts, hydatids, hypertrophy, atrophy, and earthy concretions.

1. *Acute Inflammation.*—Acute inflammation of the renal tissues is a very rare disease; it may affect the entire gland, or occur in circum-

scribed patches, and is more frequent in the cortical than in the tubular substance. The redness which accompanies it is generally limited, and varies from the slightest increase of the natural tints to a deep chocolate. This change is ordinarily combined with softening, slight intumescence, and sero-purulent infiltration. The discoloration is at first very trifling, and readily disappears under pressure and ablution. Subsequently it becomes deeper and more permanent. The injection on which the alteration of the color depends differs as it occurs in the tubular or cortical substance. In the former, it is striated; in the latter, capilliform, and disposed in beautiful wreaths. In both, it is frequently attended with small, red, black, or brownish points, not larger than a pin-head, and scattered in great numbers over the surface of the gland, or interspersed through its parenchymatous tissues. These little dots, which are merely so many ecchymoses, are sometimes surrounded by minute vesicles, which are distinct from the orifices of the divided vessels, and are nothing else than the corpuscles of Malpighi, encircled by a delicate vascular zone. In the cortical substance these little bodies are usually arranged in lines, groups, or little patches.

In the more advanced stages of the disease, the affected part is of a deep red or purple color, the ecchymoses are larger and more numerous, the vessels are filled with black blood, the renal tissues are remarkably softened, and the section of the organ exhibits numerous purulent depôts, hardly as large as a pin-head. These depôts, which are most abundant in the cortical substance, often elude detection. In a small proportion of cases, globules of lymph are effused, of a pale straw color, not unlike the Malpighian corpuscles of the spleen.

Nephritis may terminate by resolution, or it may relieve itself by softening, by passing into the chronic state, or by the formation of purulent matter. In the latter case, the pus, on inspection, will be found to be infiltrated into the glandular substance, or collected into an abscess.

2. *Abscess.*—When abscesses occur, they may be seated on the outer surface of the organ, just beneath its fibrous envelop, in the parenchymatous texture, or in the pelvis and calyces. They may be numerous and very small, or few and large; in other words, they may vary in size from that of a millet-seed or a pea to that of a walnut, a fist, or a fœtal head. When numerous or voluminous they may completely destroy the glandular structure, and convert the organ into an immense purulent cyst. Very often the sac is thick, laminated, and multilocular; the intersecting bands being of a hard, fibro-cartilaginous consistence, and grating under the knife.

When the pus is infiltrated into the parenchymatous substance, the fluid oozes out muddy and blood-tinged on pressure; and, when there is much softening, it sometimes gives the organ a dark pultaceous appearance, like the lees of wine.

The matter contained in these abscesses varies not a little in its physical properties. It may be a homogeneous fluid, like healthy pus; or it may be heterogeneous, or intermixed with foreign ingredients. In the first case, the matter is opaque, of nearly uniform consistence, and of a yellowish-cream color, with small masses of coagulating lymph; in the second, it is thin and serous, or sero-purulent, lactescent, whitish, or greenish-white, and thin or thick, viscid or curdy, like that of a scrofulous abscess. The fluid is also sometimes slightly reddish, or tinged with blood, and not unfrequently it contains sabulous matter, or even tolerably large concretions. It may be entirely inodorous, or quite fetid.

Renal abscesses generally open into the pelvis and ureter, their contents being thence discharged along with the urine. More rarely the matter finds its way to the external surface, into the cellulo-adipose tissue of the loins, or into the intestinal canal. It may also be evacuated into the peritoneal cavity, and in a few rare instances it has burst into the bronchial tubes, from which it was afterwards discharged by coughing.

*a.* The most favorable direction in which the abscess can break is into the pelvis of the kidney, from which the matter may afterwards pass along the natural channels. When the accumulation is considerable, a large quantity of fluid may thus be evacuated at once, or it may come away slowly and almost imperceptibly. The urine, in the former case, will be of a whitish, lactescent appearance, ropy, unnaturally thick, and more or less fetid; in the latter, it will be little, if at all, changed in its character, and deposit merely a slight sediment on cooling.

*b.* The matter may escape externally by exciting ulcerative absorption of the cellular tissue, muscles, and aponeuroses of the dorso-lumbar region. The progress of the fluid is indicated by excessive pain in the part, and a hard, prominent tumor, which, becoming red, soft, and fluctuating, finally gives way at one or more points. The opening thus produced frequently assumes a fistulous character, and may continue to discharge pus, or pus, urine, and sabulous matter, for many months and even years. The kidney, in this case, gradually wastes, and is ultimately reduced to a membranous bag, containing merely a little thin purulent fluid. If the matter cease to flow, a spontaneous cure may follow.

*c.* The ulceration may take place through the ureter, pelvis, calyces, or renal parenchyma, and the contents of the abscess escape into the cellular tissue of the groin. The event is preceded by violent inflammation, generally terminating in extensive infiltration and mortification of the soft parts. The muscular fibres are more or less disorganized, the cellular tissue is converted into a dark slough, resembling wet tow, and the effused matter, which occasionally extends down to the thigh, and amounts to many ounces, is almost insupportably offensive.

*d.* In the fourth place, the matter may be evacuated into the alimentary tube. The portion of intestine involved may be the ascending or descending colon, the transverse arch, or the sigmoid flexure. In inspecting the body of a boy four years and a half old, whom I had cut for stone eighteen months previously, I found a ragged, fistulous opening, about the size of half a dime, leading from the pelvis of the left kidney to the descending portion of the colon. He had labored under nephritic symptoms for several months, and had latterly voided purulent matter both along the bowel and the urethra. It is not often that the small intestine or the cæcum is the seat of the ulcerative perforation. In a case mentioned by Rayer[1] a communication existed between the right kidney and the duodenum.

*e.* The abscess may burst into the peritoneal cavity; but this occurrence is so rare that some have even doubted the possibility of it. Mr. Howship,[2] however, has recorded an instance in a boy seven years old, who had been affected with disease of the urinary apparatus from the age of eighteen months. Numerous abscesses existed in both kidneys, the largest of which, seated in the left organ, had discharged its contents into the abdominal cavity, where it produced violent peritoneal inflammation, under which the patient rapidly sunk.

*f.* Another mode in which the purulent matter may open a path for itself is through the diaphragm and pulmonary tissue. Of this occurrence only three well-authenticated examples were, until recently, upon record, the first by Meckel,[3] the second by De Haen,[4] and the last by Rayer.[5] They all existed on the left side, and all terminated fatally, the kidney in each being dilated into a membranous sac without any trace of the original gland. The patients lived some time after the fistulous communication was established, and expectorated fetid, sanious, purulent matter.

Finally, the matter, instead of finding a vent by some of the routes above specified, may be retained in the pelvis and calyces, in consequence of obstruction of the ureter, by adhesive inflammation, the presence of a renal calculus, or the deposition of tubercular matter. When this happens, the parenchymatous texture of the kidney is gradually destroyed, and the organ is dilated into a thick, tough, membranous pouch, capable of holding many ounces or even several quarts of purulent fluid.

Abscesses of the kidney, in some instances, are connected with disease of the spinal marrow and the nerves which are detached from it. The subjects of them are usually affected with paralysis of the lower half of the body, with tenderness of the spine, pain in the loins, and irritability of the bladder. The kidneys are nearly always gorged with blood, of a dark color, remarkably flaccid, and infiltrated with purulent matter.

3. *Gangrene.*—The kidney is seldom affected with gangrene; indeed, I am not certain that it is susceptible of this occurrence, except as a consequence of traumatic inflammation. At all events, very little is known respecting it. In persons who die in this way, the kidney is tumid, softened, and pervaded by a foul, offensive serosity. Some parts occasionally lose their consistence to a much greater extent than others, being of a black, livid color, and converted into a shreddy, putrilaginous substance.

4. *Softening.*—Although inflammation sometimes produces softening

---

[1] Traité des Maladies des Reins, Pl. xx.
[2] On the Urinary Organs, p. 39.
[3] Voigtel, Handbuch der Path. Anatomie, vol. iii. p. 188.
[4] Ratio Medendi, t. x. p. 103.
[5] Traité des Maladies des Reins, Pl. li.

of the renal tissues, yet this is unquestionably very rare. Of this affection there are two varieties. In one, the substance of the kidney is of a pale grayish tint, with small dot-like points, and the patient lives a long while without being sensible of any disease of the urinary apparatus; in the other, which is generally attended with serious derangement of the health, and which occasionally proceeds to a fatal termination, the renal tissues are converted into a soft, spongy mass, resembling, when shaken in water, the shaggy vessels of the placenta. The color in this species of softening may be red, gray, brown, or purple. The symptoms in both varieties are obscure, and consequently uncharacteristic. Like acute nephritis, of which this disease is commonly the result, it rarely implicates the entire viscus.

5. *Granular Degeneration.—Bright's disease* of the kidney, the granular degeneration, first pointed out by Dr. Bright, of London, is commonly the result of chronic inflammation, although occasionally it assumes an acute character. It is not peculiar to any period of life, yet it is much more frequent in adults and old people than in children and infants. It leads, as its main symptoms, to albumen and fibrinous casts in the urine, and to dropsical effusions in various parts of the body, especially in the cellular substance and peritoneal cavity.

Opportunities very rarely present themselves for examining the kidney in the incipient stage of this malady, because few patients die during such attacks. At a more advanced period the anatomical characters are so exceedingly variable that hardly any two writers are agreed respecting them. Thus they have been divided by authors into several forms; by Dr. Bright into three, by Solon into five, by Rayer into six, and by Rokitansky into eight. This excessive subdivision unnecessarily embarrasses the progress of pathological inquiry; for where is the necessity of making so many stages of the same morbid affection? On the other hand, several pathologists have of late years warmly maintained the view that entirely different diseases are included in Bright's disease, some of which may lead to the small contracted kidney, whilst others do not. I shall describe these affections as so many stages of a single morbid process.

The kidney, in the earlier stages of the disease, is of a deep red, brownish, or modena color, engorged with blood, and unnaturally soft. The loss of cohesion, however, is inconsiderable. The outer surface of the organ is somewhat rough, and the vessels which are distributed over it are arranged in small tufts or clusters. The fibrous tunic is easily stripped off, and does not exhibit any change of structure. When divided longitudinally, the section is found to be of a brownish color in the cortical substance, and of a deep red, chocolate, or amber-brown in the tubular. The whole gland is hypertrophied, flabby, and very vascular. A microscopic examination shows the minute vessels, both arteries and veins, gorged with blood, and the uriniferous tubes filled with fibrinous deposits, but the renal epithelium is unchanged, although cast off from the sides of the tubes. This condition of the kidney is best marked in the more acute form of Bright's disease, especially after scarlet fever. Dr. George Johnson[1] does not regard this state as the first stage of the granular kidney, but describes it as a separate disease, as *acute desquamative* nephritis. The urine is dark, and of high specific gravity, and contains blood corpuscles, fibrinous casts, and epithelium. The casts are generally coated with epithelium or blood-corpuscles. At a later period, but before the degeneration has made much progress, the outer surface, though less deep in color, is still more irregular, from the presence of numerous elevations and depressions, the latter of which are remarkable for containing little clusters of red vessels. By the aid of the microscope, and sometimes with the naked eye, numerous solid corpuscles may be detected upon it, like grains of sand; they are extremely minute, of a rounded or globular shape, and of a pale grayish color. The cortical substance, in the interior, is of a lighter complexion than in the sound state, and generally exhibits some shade of drab, fawn, or yellow. Innumerable little bodies, similar to those on the surface, are everywhere visible, and impart to the section the characteristic granular appearance from which the disease derives its name. The tubular cones retain their natural color, or are dark, but are sensibly diminished in size, being encroached upon, flattened, and even notched. The organ may be of the natural volume, but in general it is hypertrophied, and one-fifth, a fourth, or a third larger than in the normal condition. In a small proportion of cases it is reduced in size.

---

[1] Diseases of the Kidney. London, 1852.

A minute examination of a kidney in this stage exhibits, according to Frerichs,[1] the Malpighian corpuscles covèred with granules; its vessels are surrounded by a firm layer of fibrinous exudation mixed with numerous oil globules, and are filled for the most part with a dirty, brownish fluid. The corpuscles may be enlarged or of the normal size. The uriniferous tubes are enlarged and dilated, the walls being frequently strictured. Their interior contains fibrinous casts and epithelium cells, sometimes very large, sometimes filled with oil drops, but more generally imperfectly formed and broken up into a coarse granular matter, all of which elements will be then found in the urine lying isolated or adhering to the fibrinous casts. The fatty degeneration of the deposit, which occasionally takes place to an extreme degree in this stage of the malady, gives rise to the yellow and slightly granular kidney, which, under the term granular fat kidney, is classed by some as a separate form of Bright's disease.

In the more confirmed stages of the degeneration, the fibrous envelop is so strongly attached to the cortical substance that a portion of the latter comes off with it; it is tough, opaque, and unnaturally thick. In very young subjects it not unfrequently presents white milky-looking spots, of various size and shape. The surface of the kidney has a peculiar marbled or mottled appearance, and some parts of it are occasionally of a slate-gray or leaden-gray color; numerous vessels are seen upon it, and the whole, or the greater portion of it, is moulded into large hollows and elevations, so as to seem tuberculated or mammillated, like the surface of a cirrhosed liver. The cortical substance is very much indurated and atrophied, and presents little or none of its stria discoloration of the skin, of a bronzed hue, with anæmia, and great languor and debility, are symptoms which permit, during life, the diagnosis of disease of these organs. Whether all affections of the supra-renal capsules give rise in any degree to these symptoms or not, is not yet ascertained; but as these bodies will now be more carefully examined, we may soon expect not only to have this question settled, but also to learn much with regard to their physiology as well as diseases.

---

[1] Die Bright'sche Nierenkrankheit, p. 25. Braunschweig, 1851.

The supra-renal capsule is subject to *inflammation*, but the changes induced by this disease have not been sufficiently studied to enable us to trace its history. In a few instances, I have seen it very red, injected, and softened, without, however, being able to satisfy myself that it was inflamed. The disease, I suppose, rarely exists independently; in most cases, it is no doubt propagated to it from the kidney or some other organ.

*Abscesses* have been known to form in this viscus. Blasius[1] mentions the case of a woman, fifty years of age, in whom the left supra-renal capsule was as large as a fist, soft, reddish, and filled with black purulent matter, mixed with sand and gravel; and Lieutaud[2] has recorded an instance in which this organ contained two pounds of pus.

The supra-renal capsule is liable, in common with other organs, as the heart and liver, to the *fatty degeneration*. The abnormal deposit occupies the granular cells, and occurs either in a crystalline form, or in the form of globules. The affected gland is of a brownish, pale yellowish, or cinnamon color, of a soft, doughy consistence, and variously altered in shape and size.

*Hemorrhage* of this body is uncommon, especially as a simple, uncomplicated affection. The blood, which varies in quantity from a few drachms to several ounces, is red and fluid, black and coagulated, yellowish and firm, according to the length of time that has elapsed since it was effused, and is generally contained in one or more pouches, the walls of which are often quite tough and thick. The hemorrhage may occur at any period of life. It has been noticed in new-born infants, and in persons after the sixtieth year.

*Earthy concretions* have occasionally occurred in the supra-renal capsule; and in a few rare instances it has been observed to be changed into a substance like cartilage.

Of *tubercles* of this organ, only two cases have come under my notice. In one of these, a young man twenty-seven years of age, the right supra-renal capsule was remarkably hard, dense, of a grayish mottled aspect, and filled with concrete tubercles, many of which were quite large. The left capsule was of a light slate color, and likewise contained several scrofulous deposits.[3] In the other instance, that of a child of fifteen months, the formation was connected with pulmonary phthisis, and consisted of a large yellowish mass, of the consistence of soft putty. In both these cases, the affected organs appeared to be of the natural size.

---

[1] Observ. Anat., p. 129.

[2] Hist. Anat. Med., t. i. p. 357.

[3] See Western Journal of the Medical and Physical Sciences, vol. xi. p. 21.

in the granulations. Part of the exudation which takes place in the connecting cellular tissue leads, by being transformed into fibrous tissue, to contraction and to atrophy of the surrounding substance. In this respect the granular kidney is strictly analogous to cirrhosis of the liver, with which it often coexists. It is a further stage of degeneration from the enlarged pale kidney above described, although the possibility of this conversion has been recently doubted, but not, as it appears to me, on sufficient grounds.

6. *Induration.*—Induration of the kidney, like mollescence, may be divided into two species, one being attended with increased vascularity, the other with remarkable pallor. In the former, the organ is generally enlarged; in the latter, diminished. In the pale induration, the kidney occasionally retains its natural structure, excepting that it is unusually firm; sometimes, indeed, as will be shown hereafter, it may even be of a fibro-cartilaginous consistence. When both organs are thus affected, very little urine will be secreted, and the patient will complain of the various symptoms which characterize chronic disease of the other viscera.

7. *Hypertrophy and Atrophy:*—Hypertrophy generally exists only in one kidney, the other being either reduced in volume, or else absent. It is recognized by the following characters: the kidney is one-fourth, one-third, or one-half larger than in the normal state; and its substance is of a deeper color, more firm and compact. A development of this kind, under whatever circumstances it may occur, may be supposed always to depend upon an increased determination of blood to the sound organ. Hence we frequently find that the enlarged kidney is furnished either with two arteries, or with a single one of unusual size. In other cases, chronic irritation gives rise to this preternatural bulk of the organ, by keeping up habitual congestion. This state of the kidney, combined with augmented vascularity, is a common appearance in diabetes.

In *atrophy* of the kidney the size of the organ is much less than natural, its parenchymatous structure being pale, indurated, and shrivelled. As hypertrophy is the result of an unnatural supply of blood, so atrophy may be regarded as the consequence of a deficiency of this fluid. In some instances, this appearance is strictly congenital; but most commonly it is caused by an obstruction in the circulation of the blood, arising from the pressure of a tumor in its vicinity, an enlarged liver or spleen, or a collection of pus around its exterior, or from structural changes in the organ. I have a specimen of atrophy of the kidney in which the parenchymatous texture was nearly entirely destroyed by a number of serous cysts developed in its interior. Similar effects often follow the presence of renal calculi.

8. *Transformations.*—Under this head may be comprised the fibro-cartilaginous, osseous, and fatty transformations.

I have seen the kidney converted into a substance resembling *fibro-cartilage.* In one case the organ was less than one-third the natural volume, remarkably white, dense, and fibrous, creaking sensibly under the scalpel. The fibrous capsule was inseparably adherent to the outer surface of the kidney, the ureter and funnel-shaped promembrane is of an arborescent character; but as the morbid action advances, the vessels exhibit a capilliform arrangement, and are so much distended as to give the part a tumid appearance. The discoloration varies from the slightest rose to the deepest purple, and is always in direct proportion to the intensity of the inflammation. Although it is sometimes spread over a considerable extent, it usually occurs in small, irregular patches, separated by narrow strips of sound membrane. In their size these patches range from a split pea to a dime; in their form they may be circular, oval, linear, or angular. When the inflammation is very high, the redness may not only be very intense, but is apt to be widely diffused. Minute spots, not larger generally than the head of a pin or a hempseed, are often observed, either in the substance of the membrane or in the submucous cellular tissue; they are evidently produced by the rupture of the capillary vessels, and constitute so many real ecchymoses. Connected with this augmented vascularity are, more or less opacity, softening, and deposition of lymph, in small, whitish, circumscribed spots, or in the form of a distinct lamella moulded to the shape of the cavity in which it is located. When the disease extends to the parenchymatous structure, it is not unusual to find serosity or pus in the submucous cellular substance. Ulceration, gangrene, and perforation are exceedingly infrequent.

When the morbid action is severe, the urine contained in the pelvis and calyces is invariably mingled with muco-purulent matter, pure pus, or pure blood. The presence of these adventitious fluids is not always visible to the naked eye, but may be easily detected with the microscope.

In *chronic pyelitis*, the mucous membrane is of a grayish, dull-white, mottled, brownish, light slate, or pale mahogany tint, or entirely free from discoloration of any kind. It is opaque, thicker, and tougher than in the healthy state, rough, and incrusted with plastic lymph, firmly adherent to the surface on which it rests. In protracted cases, the excretory tubes are more or less dilated, and the veins on the surface of the kidney are enlarged, tortuous, and so arranged as to form a network. The kidney itself may be of the natural size, or it may be increased or diminished. Ulceration of the mucous membrane is infrequent, and when it does occur it rarely leads to perforation. When the effusion of lymph is very great, it may produce partial obliteration of the excretory passages, and so embarrass the flow of urine.

III. *Parenchyma of the Kidney.*—The renal parenchyma itself is comparatively seldom diseased, which is surprising when we consider the great activity of its functions, and the facility with which its secretions are modified by the most trifling deviations from health. The principal affections of this gland may be referred to inflammation, suppuration, softening, induration, fatty degeneration, scirrhus, encephaloid, tubercles, serous cysts, hydatids, hypertrophy, atrophy, and earthy concretions.

1. *Acute Inflammation.*—Acute inflammation of the renal tissues is a very rare disease; it may affect the entire gland, or occur in circum-

scribed patches, and is more frequent in the cortical than in the tubular substance. The redness which accompanies it is generally limited, and varies from the slightest increase of the natural tints to a deep chocolate. This change is ordinarily combined with softening, slight intumescence, and sero-purulent infiltration. The discoloration is at first very trifling, and readily disappears under pressure and ablution. Subsequently it becomes deeper and more permanent. The injection on which the alteration of the color depends differs as it occurs in the tubular or cortical substance. In the former, it is striated; in the latter, capilliform, and disposed in beautiful wreaths. In both, it is frequently attended with small, red, black, or brownish points, not larger than a pin-head, and scattered in great numbers over the surface of the gland, or interspersed through its parenchymatous tissues. These little dots, which are merely so many ecchymoses, are sometimes surrounded by minute vesicles, which are distinct from the orifices of the divided vessels, and are nothing else than the corpuscles of Malpighi, encircled by a delicate vascular zone. In the cortical substance these little bodies are usually arranged in lines, groups, or little patches.

In the more advanced stages of the disease, the affected part is of a deep red or purple color, the ecchymoses are larger and more numerous, the vessels are filled with black blood, the renal tissues are remarkably softened, and the section of the organ exhibits numerous purulent depôts, hardly as large as a pin-head. These depôts, which are most abundant in the cortical substance, often elude detection. In a small proportion of cases, globules of lymph are effused, of a pale straw color, not unlike the Malpighian corpuscles of the spleen.

Nephritis may terminate by resolution, or it may relieve itself by softening, by passing into the chronic state, or by the formation of purulent matter. In the latter case, the pus, on inspection, will be found to be infiltrated into the glandular substance, or collected into an abscess.

2. *Abscess.*—When abscesses occur, they may be seated on the outer surface of the organ, just beneath its fibrous envelop, in the parenchymatous texture, or in the pelvis and calyces. They may be numerous and very small, or few and large; in other words, they may vary in size from that of a millet-seed or a pea to that of a walnut, a fist, or a fœtal head. When numerous or voluminous they may completely destroy the glandular structure, and convert the organ into an immense purulent cyst. Very often the sac is thick, laminated, and multilocular; the intersecting bands being of a hard, fibro-cartilaginous consistence, and grating under the knife.

When the pus is infiltrated into the parenchymatous substance, the fluid oozes out muddy and blood-tinged on pressure; and, when there is much softening, it sometimes gives the organ a dark pultaceous appearance, like the lees of wine.

The matter contained in these abscesses varies not a little in its physical properties. It may be a homogeneous fluid, like healthy pus; or it may be heterogeneous, or intermixed with foreign ingredients. In the first case, the matter is opaque, of nearly uniform consistence, and of a yellowish-cream color, with small masses of coagulating lymph; in the second, it is thin and serous, or sero-purulent, lactescent, whitish, or greenish-white, and thin or thick, viscid or curdy, like that of a scrofulous abscess. The fluid is also sometimes slightly reddish, or tinged with blood, and not unfrequently it contains sabulous matter, or even tolerably large concretions. It may be entirely inodorous, or quite fetid.

Renal abscesses generally open into the pelvis and ureter, their contents being thence discharged along with the urine. More rarely the matter finds its way to the external surface, into the cellulo-adipose tissue of the loins, or into the intestinal canal. It may also be evacuated into the peritoneal cavity, and in a few rare instances it has burst into the bronchial tubes, from which it was afterwards discharged by coughing.

*a.* The most favorable direction in which the abscess can break is into the pelvis of the kidney, from which the matter may afterwards pass along the natural channels. When the accumulation is considerable, a large quantity of fluid may thus be evacuated at once, or it may come away slowly and almost imperceptibly. The urine, in the former case, will be of a whitish, lactescent appearance, ropy, unnaturally thick, and more or less fetid; in the latter, it will be little, if at all, changed in its character, and deposit merely a slight sediment on cooling.

*b.* The matter may escape externally by exciting ulcerative absorption of the cellular tissue, muscles, and aponeuroses of the dorso-lumbar region. The progress of the fluid is indicated by excessive pain in the part, and a hard, prominent tumor, which, becoming red, soft, and fluctuating, finally gives way at one or more points. The opening thus produced frequently assumes a fistulous character, and may continue to discharge pus, or pus, urine, and sabulous matter, for many months and even years. The kidney, in this case, gradually wastes, and is ultimately reduced to a membranous bag, containing merely a little thin purulent fluid. If the matter cease to flow, a spontaneous cure may follow.

*c.* The ulceration may take place through the ureter, pelvis, calyces, or renal parenchyma, and the contents of the abscess escape into the cellular tissue of the groin. The event is preceded by violent inflammation, generally terminating in extensive infiltration and mortification of the soft parts. The muscular fibres are more or less disorganized, the cellular tissue is converted into a dark slough, resembling wet tow, and the effused matter, which occasionally extends down to the thigh, and amounts to many ounces, is almost insupportably offensive.

*d.* In the fourth place, the matter may be evacuated into the alimentary tube. The portion of intestine involved may be the ascending or descending colon, the transverse arch, or the sigmoid flexure. In inspecting the body of a boy four years and a half old, whom I had cut for stone eighteen months previously, I found a ragged, fistulous opening, about the size of half a dime, leading from the pelvis of the left kidney to the descending portion of the colon. He had labored under nephritic symptoms for several months, and had latterly voided purulent matter both along the bowel and the urethra. It is not often that the small intestine or the cæcum is the seat of the ulcerative perforation. In a case mentioned by Rayer[1] a communication existed between the right kidney and the duodenum.

*e.* The abscess may burst into the peritoneal cavity; but this occurrence is so rare that some have even doubted the possibility of it. Mr. Howship,[2] however, has recorded an instance in a boy seven years old, who had been affected with disease of the urinary apparatus from the age of eighteen months. Numerous abscesses existed in both kidneys, the largest of which, seated in the left organ, had discharged its contents into the abdominal cavity, where it produced violent peritoneal inflammation, under which the patient rapidly sunk.

*f.* Another mode in which the purulent matter may open a path for itself is through the diaphragm and pulmonary tissue. Of this occurrence only three well-authenticated examples were, until recently, upon record, the first by Meckel,[3] the second by De Haen,[4] and the last by Rayer.[5] They all existed on the left side, and all terminated fatally, the kidney in each being dilated into a membranous sac without any trace of the original gland. The patients lived some time after the fistulous communication was established, and expectorated fetid, sanious, purulent matter.

Finally, the matter, instead of finding a vent by some of the routes above specified, may be retained in the pelvis and calyces, in consequence of obstruction of the ureter, by adhesive inflammation, the presence of a renal calculus, or the deposition of tubercular matter. When this happens, the parenchymatous texture of the kidney is gradually destroyed, and the organ is dilated into a thick, tough, membranous pouch, capable of holding many ounces or even several quarts of purulent fluid.

Abscesses of the kidney, in some instances, are connected with disease of the spinal marrow and the nerves which are detached from it. The subjects of them are usually affected with paralysis of the lower half of the body, with tenderness of the spine, pain in the loins, and irritability of the bladder. The kidneys are nearly always gorged with blood, of a dark color, remarkably flaccid, and infiltrated with purulent matter.

3. *Gangrene.*—The kidney is seldom affected with gangrene; indeed, I am not certain that it is susceptible of this occurrence, except as a consequence of traumatic inflammation. At all events, very little is known respecting it. In persons who die in this way, the kidney is tumid, softened, and pervaded by a foul, offensive serosity. Some parts occasionally lose their consistence to a much greater extent than others, being of a black, livid color, and converted into a shreddy, putrilaginous substance.

4. *Softening.*—Although inflammation sometimes produces softening

---

[1] Traité des Maladies des Reins, Pl. xx.

[2] On the Urinary Organs, p. 39.

[3] Voigtel, Handbuch der Path. Anatomie, vol. iii. p. 188.

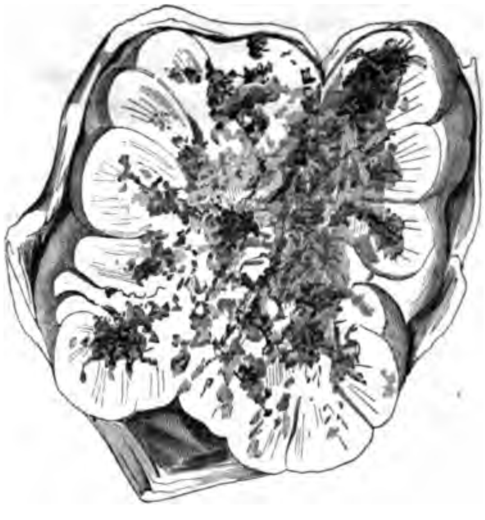
[4] Ratio Medendi, t. x. p. 103.

[5] Traité des Maladies des Reins, Pl. li.

parenchymatous substance; and, thirdly, in its excretory passages. In their size they vary between a hemp-seed and an orange; in number, from one to several hundred. The older hydatids usually contain clusters of young ones, which either float about in the serous fluid, or are attached to their inner surface. The outer cyst often possesses the firmness of a fibrous membrane; it may also be incrusted with chalky matter, or partially transformed into bone. These changes are more frequent in the sheep and other animals than in the human subject. When very large or numerous, which, however, is not often the case, the hydatids may destroy the parenchymatous substance of the kidney, and so give rise to the same morbid states as the serous cysts already described. They may remain pent up in the situation where they are originally developed, or they may escape into the excretory canals, and be evacuated along with the urine. In a few rare instances they have made their way through the lumbar region by inducing ulcerative absorption.

11. *Heterologous Formations.*—True scirrhus is extremely rare in this organ; and the same remark is applicable to colloid. *Encephaloid*, on the contrary, is not uncommon, especially in children, in whom it often acquires an enormous size. The heterologous matter usually makes its appearance in small whitish masses, which, increasing in volume and number, gradually coalesce, and at length transform the kidney into a soft, pulpy mass, of the color and consistence of the brain. (Fig. 243.) The tumor, in the advanced stage of the disease, is irregularly lobulated, the fibrous envelop loses its identity, and the pelvis and ureter are occluded by the cancerous substance. A section of the morbid growth occasionally presents a large clot, composed of loose, concentric layers, similar to those in a rapidly formed aneurism. Persons affected with this disease sometimes pass encephaloid matter with the urine, which, together with the pain and enlargement in the lumbar region, serves as an important diagnostic character of the nature of the morbid action.

Fig. 243.

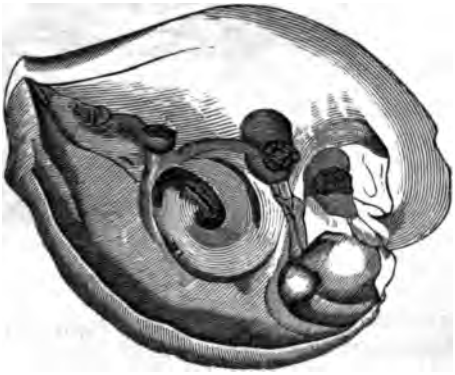


Encephaloid of the kidney. From a preparation in my cabinet.

*Melanosis* of this organ has been found only in a few instances. Like tubercle, it rarely, if ever, exists except in association with similar deposits in other parts of the body, as the skin, cellular tissue, lungs, liver, and serous membranes. It may present itself as an infiltration, but more commonly it occurs in small disseminated tumors, from the size of a pin-head to that of a hazel-nut, of an irregularly spherical figure, hard, of a black, brownish, or dark grayish color, and embedded in the cortical substance, immediately beneath the fibrous capsule. The heterologous matter is occasionally deposited in a distinct cyst, filled with a liquid of the color and consistence of ink. When the new substance is very abundant, the kidney is usually somewhat augmented in volume, but in almost all cases it retains its normal bulk and form. It is of a spongy, vascular character, analogous to the cavernous body of the penis, and is formed by the interlacement of a great number of small veins, dilated at various points of their extent, and supported by delicate cellular substance. It is generally seated in the cortical texture of the kidney, and coexists with a similar alteration in other parts of the body.

It is not often that *tubercles* occur in the kidney, and then only in connection with the same disease in other situations, particularly the lungs, lymphatic ganglions, liver, intestines, and genito-urinary apparatus. The heterologous matter may be deposited on the surface of the organ, in the cortical substance, or in the uriniferous cones, in the form of small disseminated masses, from the volume of a mustard-seed to that of a cherry or small marble, of a pale yellowish or whitish aspect, and of a firm, cheesy, almost fibro-cartilaginous consistence. Their number is sometimes immense. Thus, in the right kidney of a young man, of twenty-seven, who died of psoas abscess, there were upwards of five hundred in the cortical substance, of all sizes between that of a mustard-seed and a cherry-stone. In some parts they were agglomerated, in others isolated. They were of a white opaque appearance, semi-cartilaginous in their consistence, and evidently organized, since, in cutting through some of them, I could distinctly trace the existence of vessels, the blood standing upon the incised surface in minute dots. Externally the organ had a dark mottled aspect, and in its interior were two tubercular excavations; one, situated in the superior extremity of the gland, was scarcely larger than a hazel-nut; the other, which occupied the lower half of the viscus, was about the size of a turkey's egg, and filled with thin, ropy, whitish pus, destitute of smell. The abscess was lined throughout by a thick layer of lymph, and intersecting it in different directions were four rounded cords, the remains, probably of the tubular texture, which resembled

Fig. 244.



Tubercular excavations of the right kidney. From a specimen in my cabinet.

a good deal the fleshy columns of the heart, or the bands which we so often see in tubercular excavations of the lungs (Fig. 244). The kidney was very little enlarged: some tubercular matter was also found in the excretory passages, the cavity of the ureter having been nearly obliterated by it.

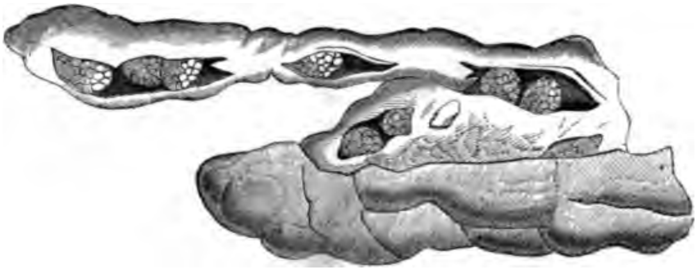
In this case not a tubercle could be detected in the lungs. They were, indeed, perfectly sound, as were also the heart and brain, together with most of the abdominal viscera. Strumous matter was abundantly contained in the lymphatic ganglions of the pelvis, and the seminal vesicles were completely distended with it.

The tubercular matter is sometimes deposited upon the free surface of the calyces, pelvis, and ureter, either in small, circumscribed granular masses, or in that of a continuous layer, of variable thickness, yellowish or grayish in its color, and more or less accurately moulded to the shape of the containing parts. The quantity of the effused matter may be very small, or so large as to lead to serious impediment to the passage of the urinary fluid. I have twice found it so great as to cause complete obliteration of the commencement of the ureter.

The volume of the kidney may be natural or diminished, but most commonly it is somewhat increased. In cases in which the deposit takes place rapidly the kidney is generally very vascular. It has been said that both organs are usually attacked by this disease; an opinion which is disproved by the observations of Rayer, who found double tuberculization only in six cases out of sixteen. Of the remaining cases seven occurred on the left side.

12. *Calculi.*—Calculi of the kidney may be developed either in its parenchymatous substance, the calyces, funnel-shaped processes, or the pelvis of the ureter (Fig. 245), being in most cases the result of a peculiar diathesis of the system. They generally consist of the same chemical elements as those of the bladder. The commonest variety is the uric calculus, which is usually of a light brownish color, and of a spherical shape, with a perfectly smooth surface. Next in point of frequency is the oxalic concretion, of a dark complexion, and of an irregular, oval figure, with a rough mulberry exterior. A third variety of renal calculus is the ammoniaco-magnesian. This generally occurs in connection with one or the other of the preceding species, an external

Fig. 245.



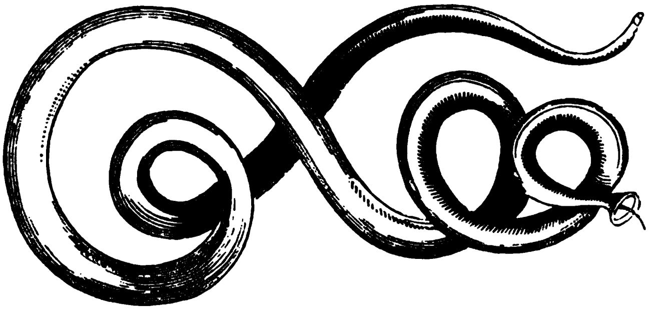
Calculi of the kidney and ureter. From a specimen in Professor Willard Parker's collection.

layer forming around them, varying in thickness from a line to half an inch or more. The phosphatic concretion is seldom met with in the kidney, and seems not to proceed from the urine, but from other secretions of the affected organ.

Renal calculi may exist for a long time unsuspected. Most generally, however, they produce hemorrhage, inflammation, abscess, or ulceration, with pain in the loins, obstruction to the flow of urine, uneasiness in the ureter and bladder, and constitutional disturbance. Should the concretion become immovably fixed in the excretory duct, the urine, which is still secreted, will accumulate in the passages above; and, by the pressure which it exerts upon the parenchymatous structure, it will gradually effect its absorption, until the organ is wasted to a mere remnant. At other times, the ureter bursts, as the urethra sometimes does behind a stricture; or suppression of urine ensues, and the patient dies.

13. *Worms.*—The *large strongyle* (Fig. 246), a species of lumbricoid worm, has been observed in a few rare instances in the human kidney. It is oftener met with in the inferior animals, as the horse, ox, wolf, dog, otter, and raccoon, and is exceedingly common in the hogs which are brought to the slaughter-houses in the environs of Cincinnati, Louisville, and other western cities. The situations in which it is ordinarily found are the pelvis and infundibular prolongations of the ureter, in which it is frequently coiled up in considerable numbers. Occasionally it makes its way into the parenchymatous structure, where it produces suppuration, atrophy, and other mischief.

Fig. 246.



The strongyle is a very slender cylindrical worm, from two to three inches long, of a light grayish color, interspersed with dark spots; in some instances it has been known to attain the length of three feet, with a diameter of from four to six lines. The male is smaller than the female, and tapers slightly towards each extremity. The head is obtuse, and furnished with an orbicular mouth, encircled by six hemispherical papillæ: the body is transversely striated, and marked by two longitudinal impressions; and the tail, which is incurvated, ends in a dilated pouch, from the base of which projects a single penis. In the female, the caudal extremity is less pointed than in the male, with the anus just below the apex; the vulva is situated at a short distance from the head, and communicates with a slender cylindrical vagina: the uterus, in the larger individuals, is about three inches long, and leads to a simple ovary, which is nearly four times the length of the body. A nervous system can be distinctly demonstrated in this parasite. It seems to consist of two delicate rings, one encircling the oesophagus, the other the anus, connected by a single cord running in a straight line along the middle of the ventral aspect.

14. *Laceration.*—The kidney, notwithstanding the firmness of its texture and the depth at which it is situated, is liable to laceration from external violence. The rupture may be confined to the cortical substance, or it may extend through this into the tubular, or even into the pelvis and calyces, though this is exceedingly rare. Occasionally it passes through the whole thickness of the organ, so as to divide it into two distinct parts, one of which is generally somewhat larger than the other. In its direction the fissure, crack, or rupture is usually transverse or oblique, seldom longitudinal. The number may be limited to one, or there may be as many as eight or nine, as in the interesting case narrated by Dr. Kirkbride,[1] of this city, in which the principal rent was three inches and a half in length by nine lines in depth.

Rupture of the kidney is usually attended with considerable effusion of blood into the surrounding cellular tissue, and sometimes also into the peritoneal cavity. It may occur alone, or be complicated with laceration of the liver, spleen, bowels, or urinary bladder, with fracture of the ribs and pelvic bones, and with contusion of the skin and muscles. It is worthy of note, however, that, in some instances, there is no mark whatever of exernal violence, not even the slightest ecchymosis. The accident is commonly produced by falls from a height, or by the body being pressed between two hard and resisting objects. It may also result from the kick of a horse, and, in one instance, it was caused by a blow with a bludgeon upon the right lumbar region.[2] The patient generally voids more or less blood soon after the injury; the period at which death occurs varies from a few minutes to several hours, days, or weeks. The lesion, however, is probably not always fatal. In favorable cases, lymph is effused between the lips of the rupture, by which the breach is ultimately repaired, and the extravasation of urine into the retro-peritoneal cellular tissue prevented.

15. *Malformations.*—Considerable variety is observed in regard to the original conformation and situation of the kidneys. No well authenticated case has yet been recorded, I believe, of the complete absence of both these organs. One is sometimes absent, and then the other is generally unnaturally large, to compensate for the deficiency.

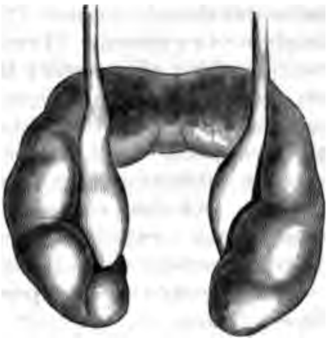
It is not rare to see one of these viscera in front of the spinal column,

---

[1] American Journal of the Medical Sciences, vol. xv. p. 359.

[2] Morgagni, de Sedibus et caus. Morb., Epist. liv., § 15.

Fig. 247.



Horseshoe kidney. From a specimen in my cabinet.

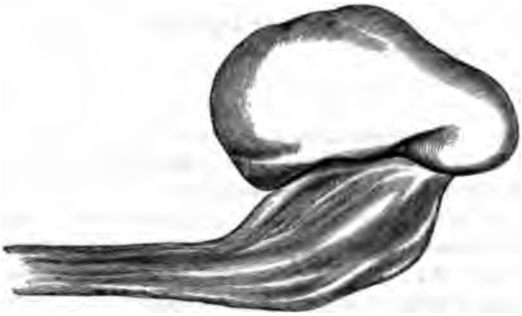
or in the cavity of the pelvis, the other occupying its usual situation. Sometimes they are joined together by a narrow isthmus. When this is the case, they lie close to the vertebræ, forming a kind of arch, with the concavity towards the diaphragm; they are more compressed than usual, the fissure is absent, and the vessels enter lower down, generally at the anterior surface. The situation of the ureter is likewise different. (Fig. 247). Instances have been recorded of individuals who had three kidneys. In these cases, either two of the organs were on the same side, or they occupied their usual place, whilst the supernumerary one was situated in front of the spine, or within the pelvic cavity.

## SECTION III.

### URETER.

The principal lesions of the ureter are deposits of tubercular matter, and lymph upon its surface, thickening and attenuation of its walls, with contraction or enlargement of its cavity. Dilatation (Fig. 248,) is generally produced by the retention of a renal calculus, or by some tumor seated along the course of the tube, and interfering with the egress of the urine. In the male, it is sometimes caused by stricture of the urethra; in the female, by the pressure of a carcinomatous uterus. In a case of this description, which fell under my notice several years ago, the left ureter was fully as large as the thumb, with remarkably thin, transparent walls.

Fig. 248.



Dilatation of the ureter and pelvis of the kidney. From a specimen in my cabinet.

Small *cysts*, from the size of a pin-head to that of a pea, are sometimes developed beneath the mucous membrane of the ureter, either singly or in groups. They are of a spherical figure, transparent, and occupied by a thin watery fluid, by inspissated mucus, or by a yellowish, semi-concrete substance, not unlike that of tubercle. Occurring sometimes simultaneously in the calyces, pelvis, and ureter, they are most common in the latter situation, and are probably nothing but mucous follicles, enlarged in consequence of the obstruction of their orifices. As they augment in size some of these cysts burst, apparently from over distension, and discharge their contents into the ureter, leaving a small ulcer, with thin, irregular, and inverted edges.

Occasionally the duct presents a singularly *sacculated* arrangement, some portions of it being greatly expanded, others very much constricted.

The ureters may be *absent*, and in some instances they have been known to terminate in a cul-de-sac. When the bladder is wanting, they open either into the urethra, the vagina, or the rectum. Occasionally, again, they are reduced to small, narrow, almost impervious cords; and when this happens, the pelves of the kidneys are generally dilated into large pouches, capable of holding many ounces of fluid. I have never seen valves in the interior of these tubes; but examples of this have been recorded by different writers, and are perhaps more frequent than is generally supposed. These folds, it may be remarked, are usually connected with a dilated and tortuous state of the ureters.

## SECTION IV.

### URINARY BLADDER.

The bladder is liable to inflammation, suppuration, gangrene, softening, ulceration, hypertrophy, hernial pouches, the heterologous formations, rupture, worms, calculi, and congenital vices.

1. *Inflammation.*—The disease usually occurs in small irregular patches; and is anatomically characterized by increased vascularity, loss of transparency, softening, and deposits of lymph, with alteration of the natural secretion.

The discoloration varies, according to the extent and degree of the morbid action, from the lightest rose to the deepest purple. It usually displays itself in small and tolerably well-defined patches, which are always most distinct at the centre of the inflamed part, from which they gradually diminish in intensity until they are insensibly lost in the surrounding healthy structures. In some cases, especially in such as run their course with great rapidity, blood is effused in the submucous cellular tissue, and the part exhibits a truly ecchymotic aspect, similar to that which is seen in a bloodshot eye. This appearance existed, in a remarkable degree, in the bladder of a young man of about twenty, whose body I examined a few years ago. Nothing was known of his previous history, but it was evident from the condition of his bowels, that he had died of colitis. The bladder contained about four ounces of dirty, turbid looking urine; and the mucous membrane, at the bas-fond, over a space of about three inches in diameter, was a deep cherry color, from the presence of extravasated blood in the submucous cellular tissue. A portion of the affected surface was incrusted with coagulating lymph, which had to be removed before the extent of the ecchymosis could be fully traced. There can be little doubt that this man had a violent attack of cystitis a short time before his death. The bloodvessels, in this disease, have either an arborescent or capilliform arrangement, according to the severity of the morbid action.

More or less opacity almost always accompanies the discoloration; and when the disease is unusually violent, there is not only some degree of softening, but also considerable tumefaction of the mucous membrane. These changes are generally most conspicuous in those cases in which the inflammation has been somewhat protracted. A deposit of lymph is rather a rare phenomenon, and appears to occur chiefly as a result of external violence, the inordinate use of cantharides, or the irritation of a calculous concretion. The veins about the neck and bas-fond of the bladder are engorged with black blood, and the muscular tunic is preternaturally red, softened, and, in some places, almost gangrenous. When the inflammation has involved the peritoneal investment, this part will be found abnormally vascular, incrusted with lymph, and, perhaps, more or less adherent to the surrounding viscera. In some instances, minute abscesses are seen in the submucous cellular tissue, or in the substance of the muscular coat, and purulent matter in the veins of the neck of the bladder and of the prostate gland. These phenomena are most apt to occur in traumatic cystitis. At the commencement of the disease, the secretion of mucus is somewhat augmented in quantity, but thinner and less viscid than in the natural state. When at its height, it is almost entirely suppressed, and the membrane is consequently somewhat dry, just as in acute inflammation of the Schneiderian membrane; but as this period is always of short duration, the secretion is soon re-established, and often exists in great abundance, being of a thick, ropy consistence, and of a pale straw, grayish, drab, or greenish color. In the higher grades of the disease, the secretion, instead of being mucous, is puriform, or muco-purulent, and tinged with blood, which seems to be poured out, under these circumstances, in the form of exhalation, though occasionally it is no doubt caused by a laceration of some of the capillary vessels.

2. *Suppuration.*—The termination by suppuration is by no means infrequent. The matter, in most cases, is poured upon the inner surface of the bladder, where, mixing with the urine, it imparts to this fluid a peculiar lactescent aspect, and sometimes a very offensive odor. In other cases, the pus collects in the submucous cellular tissue, or between the muscular and serous tunics, and finally escapes into the pelvic cavity. Occasionally the bladder contracts adhesions with the

rectum of the male or the vagina of the female, and the matter finds an outlet in this way. The quantity of pus seldom exceeds two or three ounces.

3. *Gangrene.*—Idiopathic gangrene of the bladder is extremely rare. It is most frequently seated at the neck of the viscus, and is remarked chiefly as a result of the protracted retention of urine. The eschars are of a dark, livid color, soft, easily torn, and bathed with a thin sanious fluid, of an exceeding fetid odor.

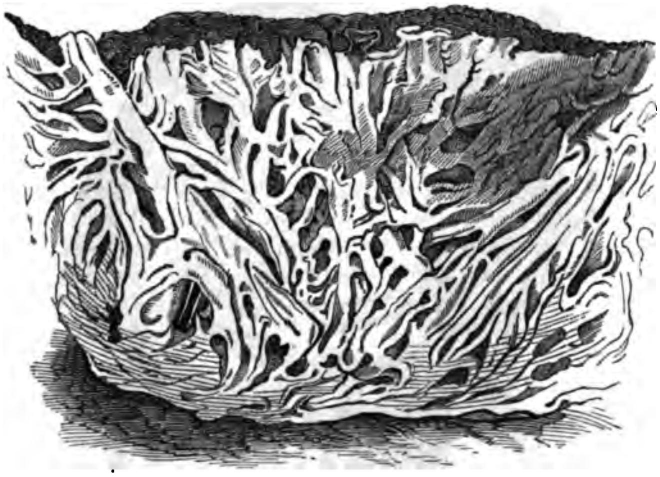
4. *Softening.*—It is very seldom, indeed, that the mucous membrane of the bladder is the seat of softening. When thus affected, it is of a dull white, pale gray, or drab color, devoid of vascularity, and so changed in its cohesive properties that it may be easily scraped away with the nail or the handle of a scalpel. It may retain its natural thickness, or it may exhibit a pulpy and infiltrated appearance, or it may be thin and withered. The softening may occur in patches of various shapes and sizes, or it may extend over the whole tunic, which, however, is extremely rare. In the few cases in which I have witnessed this lesion it was confined to the bas-fond of the organ, and was associated with other affections, as ulceration, tubercular deposits, hypertrophy of the prostate gland, or stricture of the urethra. In violent cystitis, the disease sometimes extends to the submucous cellular tissue and muscular fibres, which are infiltrated with serosity, changed in color, soft, and lacerable. There is a variety of mollescence of the urinary bladder which may be called *idiopathic*, as it is usually connected with a disordered state of the system, such as that arising from the excessive loss of blood, impoverished diet, or protracted indisposition. The mucous membrane, in this case, is of a pale, milky hue, either uniformly, or in small strips or patches, and of the consistence of soft glue, isinglass, or jelly.

5. *Ulceration.*—Ulceration of this organ is uncommon. When of the simple kind, it is usually the consequence of ordinary inflammation, of the bursting of an abscess, or of the pressure of a calculus. The erosions vary much in size, depth, shape, and number, in the appearance of their edges, and in their tendency to heal, which, owing to the irritating character of the urine, and the constant motion of the bladder, they rarely attain, or successfully accomplish. In stone of the bladder I have seen the mucous coat destroyed over a large extent of surface; but, in general, the ulcers are small, not exceeding a few lines in diameter, of an oval or circular shape, resting upon the submucous cellular tissue, and having irregular and slightly undermined edges. In some instances they manifest a disposition to extend, the morbid action going on until a communication is established with the rectum, ileum, colon, vagina, or peritoneal cavity.

6. *Chronic Inflammation and Hypertrophy.*—Chronic inflammation is much more frequent than acute, of which it is sometimes the result, and gives rise to various alterations, among which the more important are, hypertrophy, the formation of cysts, and fungous excrescences, not unlike those that have been described as occurring in the large bowel. Hypertrophy, although it may be seated in any of the tunics, is most common in the muscular, which sometimes acquires the

thickness of nearly half an inch. The lesion is often partial, that is, it is limited to a small number of fleshy fibres, which are of a deep florid color, very strong, and collected into large bundles. When this happens, the inner surface of the organ becomes fasciculated, like the interior of the ventricles of the heart, and thus constitutes what is termed the *columniform* bladder. (Fig. 249). The accompanying woodcut, which exhibits the various characters presented by this affection, is taken from a specimen in my collection.

Fig. 249.



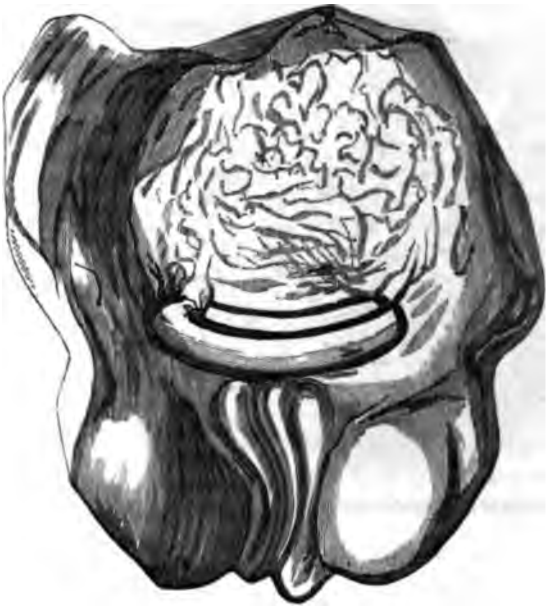
Hypertrophy of the muscular fibres of the bladder. From a specimen in my cabinet.

Hypertrophy of the muscular tunic, whether partial or general, is usually referable to obstruction at the mouth of the urethra, to overcome which it is obliged to make increased exertion; a larger flow of blood is invited, and excess of nutrition, with diminished capacity of the reservoir, is the consequence. This condition frequently coexists with vesical calculi, enlargement of the prostate gland, and stricture of the urethra.

When the hypertrophy is seated in the lining membrane, or in the subjacent cellular substance, there is generally a great development of the mucous follicles, which, instead of being small and scarcely perceptible, as they are in the normal state, are rendered extremely prominent, and pour out an unusual amount of thick ropy fluid. In some instances we meet with well developed villosities, and, more frequently still, with pretty large, fungous-looking excrescences. These vegetations, as they may be termed, are commonly of a light slate color, firm in their consistence, and of a pyriform shape, with a short, slender peduncle. Around their base are occasionally to be observed beautiful vascular wreaths, showing that they originate in inflammation.

The mucous membrane at the neck of the bladder is sometimes elevated into one or more horizontal ridges, varying from one to two inches in length by three or four lines in width. The annexed drawing (Fig. 250), from a beautiful specimen in my cabinet, represents two prominences of this description, both of large size. The prostate gland is very much increased in size, and the muscular coat is hypertrophied throughout. The lesion is evidently the result of chronic irritation.

Fig. 250.



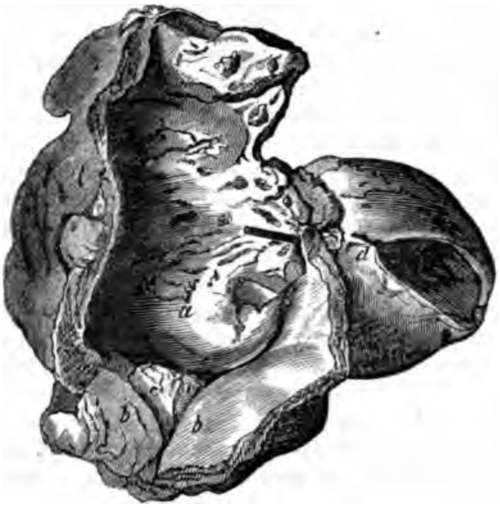
Hypertrophy of the bladder, exhibiting the corrugated appearance of its lining membrane, with a bar-like formation at its neck, and hypertrophy of the prostate gland.

7. *Atrophy of the Bladder.*—This affection is usually the result of long-continued compression, produced by the presence of a pelvic tumor, or some similar cause, interfering with the nutrition of the viscus. When this is carried to any considerable extent, the cavity of the bladder may be so much diminished as to be unable to hold more than a few ounces of urine, at the same time that its walls are pale and attenuated. Sometimes the atrophy is limited to the muscular fibres, as we see when the organ has been subjected for a long time to over-distension from paralysis. When this is the case, they have a pallid, wasted, straggling appearance, similar to what occasionally occurs in the coats of the stomach and bowels.

8. *Sac-like Pouches.*—A frequent consequence of hypertrophy of this viscus is a development of small sacs, caused by the outward protrusion of the mucous membrane, or by the interlacement of the muscular fibres. In the latter case, considerable cavities are sometimes intercepted, which become lined with a sheeting of lymph, and filled with different fluids, such as serum, urine, or pus. When the lining membrane is forced between the enlarged fascicules, it occasionally dilates into a large pouch, perhaps half as large as the bladder itself,

with which it communicates by a narrow aperture. (Fig. 251.) This appearance is generally observed near the fundus of the organ, and is much more common in the male than in the female, as in the

Fig. 251.



Section of the bladder and prostate. *a.* Mucous surface of the bladder. *b, b.* Lateral lobes of the prostate. *c.* Middle lobe. *d.* Large cyst or pouch, partially laid open, and communicating with the bladder by a small orifice. From a preparation in my private collection.

latter, from the peculiar construction of the urinary passages, there are fewer causes to produce it. The walls of these cysts are often much thickened by new deposits, and not unfrequently they contain calculous concretions. The bladder, in this state, is almost always irritable, and admits of very little distension. The number of sacs varies from one to six or ten.

9. *Heterologous Formations.*—Encephaloid of the bladder seldom occurs as an original disease; most commonly it is propagated to it from the surrounding organs, as the rectum and the uterus. It appears to take its rise in the submucous cellular tissue; forming, as it advances, a large tumor, which projects into the cavity of the organ, and greatly diminishes its capacity. In some instances it makes its way in other directions, passing outwards, and contracting adhesions with the sides of the pelvis, the uterus, or the bowels. Such growths are sometimes of a mixed character, scirrhous, cartilaginous, and fungous; and, occasionally, they are found studding the inner surface of the bladder in great numbers, being not larger than a common pea, and of a soft medullary texture. Scirrhus and *melanosis* of the bladder are extremely rare. In a case of general melanosis, described in the chapter on that disease, I observed five small, but well marked tubercles of this kind, seated at different points in the submucous cellular tissue.

The occurrence of *tubercle* in the urinary bladder is much less frequent than in the larynx, trachea, and intestinal canal. Indeed, it is among the rarest diseases to which this organ is liable. It is usually associated with tubercle of the kidneys, seminal vesicle, prostate gland, or other parts of the body, and is most common in persons between twenty-five and fifty. The heterologous matter is deposited in small, discrete granules in the submucous cellular tissue, or in this substance and the mucous membrane, which is raised into little points, hard to the touch, and encircled by delicate vascular zones. The ulcers which are left by the softening of this matter are generally very small, and of an irregularly rounded form, with thin, ragged edges; cases, however, occur where they involve the whole mucous lining, which is finally completely destroyed, the muscular fibres presenting the appearance as if they had been neatly dissected by the anatomist.

10. *Neuralgia.*—In persons of a nervous, irritable temperament, the bladder is sometimes the seat of severe pain, darting through the pelvis in different directions, and recurring in regular paroxysms. In its nature, it is evidently neuralgic, and it is often associated with similar uneasiness in other parts of the body, especially the face and scalp. In some cases, it seems to be produced by sympathy with the kidney, by an altered state of the urinary fluid, and by the presence of a calculus.

11. *Laceration.*—Rupture of the urinary bladder, although certainly not common, is yet sufficiently frequent to render it an object of interest both to the pathologist and medical jurist. The causes which may give rise to this accident are, over-distension of the organ attended with softening of the mucous membrane and muscular fibres, gangrene and perforative ulceration, external violence, and, in the female, the pressure of the child's head during parturition. In whatever manner the laceration is induced, it is always followed by an escape of urine into the connecting cellular tissue, or peritoneal cavity, where its presence soon excites fatal inflammation. The period at which death takes place varies from a few hours to as many weeks, but the great majority of patients perish within the first three or four days. When caused by external violence, the lesion may be complicated with fracture of the pelvic bones, rupture of some of the parenchymatous organs, as the kidney, liver, or spleen, contusion of the skin and abdominal muscles, and more or less effusion of blood into the peritoneal cavity. The blood poured out sometimes amounts to several pounds, and may proceed from the laceration of a great number of small vessels, or from the injury of a single large one. The size, situation, number, direction, and form of the accidental opening are extremely variable, and do not admit of any specific description. The ruptured organ is usually very much contracted, and rarely contains more than a few drachms of urine. When the lesion is the result of injury there is often no mark whatever of external violence, such as contusion or ecchymosis; a fact of great interest in a medico-legal point of view.

This organ is sometimes lacerated by causes apparently the most trifling. Zivinger[1] attended a young man whose bladder was torn by a severe blow on the lower part of the hypogastric region, unaccompanied by the slightest appearance of external violence. A similar example is related by Zittmann.[1] Montagu[2] saw a case of rupture of this organ from a fall on the abdomen; and Dupuytren[3] met with one where the lesion was produced by a kick in a scuffle. In this case the patient survived until the seventeenth day. On dissection, marks of adhesion were seen between the intestines and bladder, on the anterior surface of which existed two rents, one of them an inch and a half in length.

---

[1] Ephem. Nat. Cour., cent. vii., obs. 30.

12. *Malformations.*—The bladder is liable to various malformations, a bare enumeration of which is all that my limited space will permit me to attempt.

Total absence of the organ has been observed only in a few instances. When it exists, the ureters open either into the rectum, the urethra, or the vagina. In the former case, the arrangement resembles that of birds and reptiles, in the formation of a true cloaca.

Secondly, the viscus is sometimes divided into several compartments, either congenitally, or as a consequence of disease. In either event, the cavities generally communicate directly with each other. Cases of this kind are described and delineated in my work on the urinary organs.

Thirdly, the organ is deficient in front, constituting what is termed *extrophy* of the bladder. The malformation is always accompanied by imperfect development of the abdominal muscles, the pubic bones, and the genital organs. The posterior wall of the viscus is pushed forward into the vacant space, forming a hemispherical tumor, of a florid color, which receives the orifices of the urethra, from which the urine constantly dribbles over the surrounding parts. The annexed cut (Fig. 252), copied from my treatise on the urinary organs, conveys an excellent idea of the nature of this affection.

13. *Worms.*—The urinary bladder occasionally contains worms, which are either of a distinct and specific character, such as are found in no other situation, or they creep into it from the rectum, colon, or small intestine. In nearly all the recorded instances of the latter, the animal was of the lumbricoid or vermicular variety, which left its accustomed habitation, and passed into the urinary reservoir, either by perforating the coats of the alimentary canal, or, as more frequently happens, through an opening made by ulcerative action, from the irritation produced by an abscess, a piece of bone, or some extraneous body.

Of the worms which naturally inhabit the urinary bladder, only two species have hitherto been discovered, the one by Mr. William Lawrence, the other by Mr. T. B. Curling, of London. The animal described[4] by the first of these distinguished surgeons, is the *spiroptera*, of which, in the space of about two years, a young, unmarried woman, twenty-four years of age, voided not less than from eight hundred to a thousand. They varied in length from four to six inches, and were remarkably slender at the middle, from which they gradually increased towards the extremities, which were small and tapering. One of the surfaces of the body exhibited the appearance of a double row of small protuberances, while the other was marked by a groove with two rising edges. They were soft when first voided, and of a yellowish color. The body seemed homogeneous throughout, and careful microscopical observation failed to throw any light upon their organization.

---

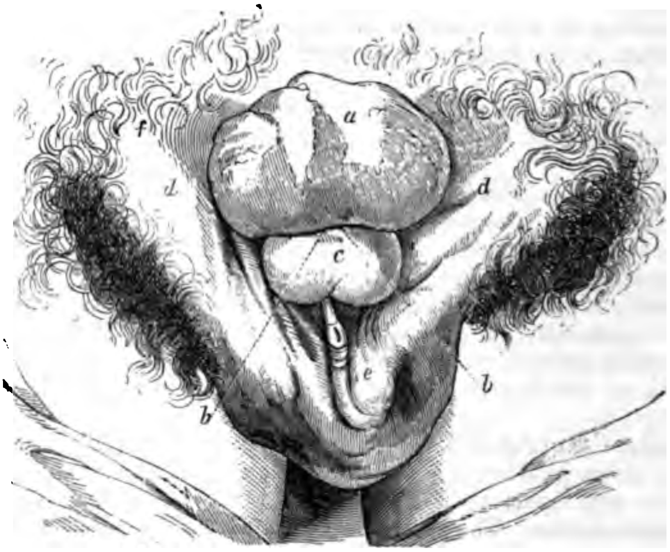
[1] Op. cit., cent. v. obs. 22.

[2] Medical Communications of London, vol. ii. obs. 23, 1790.

[3] American Journ. Med. Sciences, vol. xii. p. 535.

[4] Medico-Chir. Trans. of London, vol. ii. p. 385.

Fig. 252.



Extrophy of the bladder. *a.* Everted bladder. *b, b.* Orifices of the ureters. *c.* Penis without urethra. *d, d.* Pubic symphysis. *e.* Scrotum and testis. *f.* Congenital inguinal hernia.

The smaller worms, which were seen only on one occasion, were semitransparent, and of a rounded form, with pointed extremities. I am not acquainted with any instances in which this worm has been noticed in the human subject by other observers.

Fig. 253.

Fig. 254.

The worm discovered by Mr. Curling[1] has been named by him *dactylius aculeatus*, from its peculiar ring-like appearance. It was voided with the urine, for a number of days, by a little girl, five years of age, who was affected with subacute pneumonitis, and who was also occasionally troubled with ascarides. The worm is of a light color, cylindrical in its form, annulated, and slightly tapering towards the extremities, particularly the anterior, which is the smaller. The female is four-fifths of an inch long (Fig.

---

[1] Medico-Chir. Transactions of London, vol. xxii. p. 274.

253), the male two-fifths (Fig. 254). The head is truncated; the mouth orbicular; the neck distinctly annulated; and the tail, also annulated, is obtuse. The tegument, of a delicate transparent structure, and containing two layers of muscular fibres, one circular, and the other longitudinal, is armed with a number of sharp-pointed spines, arranged in equidistant rows, in clusters of three, four, or even five. They cover nearly the whole surface, and seem to be perfectly under the control of the animal, which has the power of protruding and retracting them at pleasure. The alimentary canal commences at the mouth by three small convoluted tubes, which soon unite into a single one, which proceeds for some distance in a tortuous direction, when it becomes sacculated, and, enlarging as it descends, terminates at the extremity of the tail in a trilobular anus.

The structure of the female is much more complicated than that of the male. The vulva is situated near the anterior extremity, about one-fifth of an inch from the head, and has the appearance of an opaque, mammillated process. The animal swells at this part, the tegument is thicker, there are no spines, and, for a short distance above and below the vulva, the body is encircled by a series of regular, dark-colored fibres. About midway between the head and vulva, and on opposite sides of the alimentary canal, are two gra-

Fig. 255.

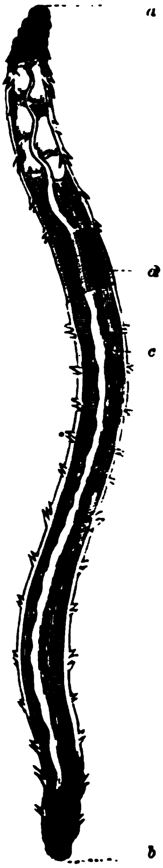


Fig. 255.—*a*. The head; *b*. The caudal extremity; *c*. Sacculated alimentary canal; *d*. Dark lines at the junction of the anterior and middle third of the animal.

Fig. 256.

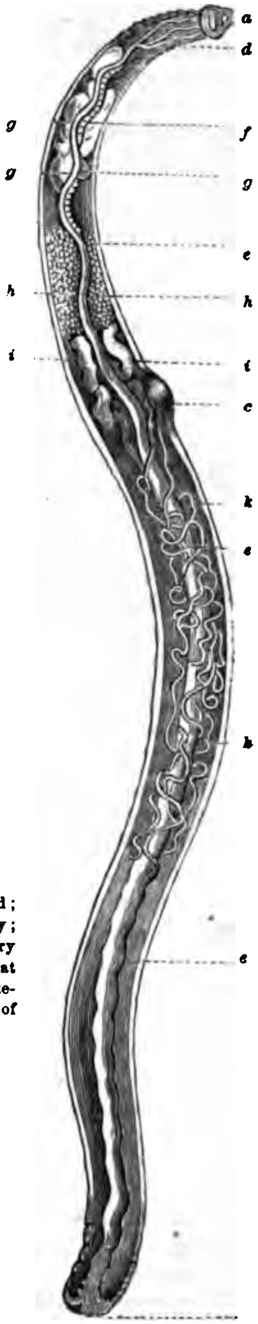


Fig. 256.—*a*. Head, with the orbicular mouth; *b*. Caudal extremity, with the labiated anus; *c*. Vulva; *d*. The three tubes by which the alimentary canal commences; *e*. Alimentary canal; *f*. Pulsating tube in the alimentary canal; *g*. Lobulated bodies round the commencement of the alimentary canal; *h*. Glandular bodies on the sides of the canal; *i*. Movable fimbriated bodies near the vulva; *k*. Convoluted oviducts.

nular bodies, of an oval form, and just below these, two slightly convoluted tubular processes. No genital apparatus was discernible in the male. Both sexes have a distinct vascular, and, doubtless, also a nervous system. The annexed wood-cuts represent the internal structure of the worm. Fig. 255 is the male, Fig. 256 the female, both magnified ten times.

Having thus briefly considered the several lesions of the bladder, I shall bring this section to a close by making some remarks on the morbid states of the urine, urinary deposits, and urinary calculi.

14. *Morbid Urine.*—Three varieties of urine, differing materially in their physical and chemical properties, are recognized by modern observers. These are respectively denominated potous, chylous, and sanguineous. The first is that passed a short time after the free use of fluids, and is generally of a pale color; it is of low specific gravity, rarely exceeding 1.009, and contains comparatively little solid matter. In chylous urine, the product of the digestion of a full meal, the specific gravity is generally considerably increased, and may be said to range between 1.020 and 1.030, the latter of which, however, it rarely attains. The sanguineous urine, the urine of the blood, or the morning urine, is the most elaborate variety of the three. It is of the average density of 1.015 to 1.025, and exhibits in perfection all the essential properties of this important fluid.

The following is the average of three analyses of healthy urine by M. Lehmann:—

| | |
|---|---|
| Water | 934.567 |
| Urea | 32.424 |
| Uric acid | 1.064 |
| Lactic acid | 1.520 |
| Lactates | 1.565 |
| Mucus | 0.107 |
| Alkaline sulphates | 7.308 |
| Phosphate of soda | 3.806 |
| Phosphates of lime and magnesia | 1.142 |
| Chlorides of soda and ammonia | 3.653 |
| Watery extract | 0.614 |
| Alcoholic extract | 10.267 |

The urine is greatly influenced by disease, diet, and other circumstances. A brief outline of these changes is all that can be attempted in a work of this kind.

1. *Water*, being naturally present in greatest abundance, is more liable to variation than any of the other constituents of the urine. In nervous diseases, especially such as are of a hysterical character, this secretion is generally unusually copious as well as remarkably thin and limpid, looking more like well-water than common urine. In diabetes insipidus, the urine, which is often discharged in immense quantities, consists almost wholly of water; the urea is entirely absent; and the fluid, on evaporation, deposits a yellow brownish syrup, in which there is no appearance of crystals, and which possesses a very feeble acid reaction.

*Urea*, next to water, exists more largely in healthy urine than any other ingredient. The quantity daily voided by a healthy adult man varies from four to seven drachms; in the female, child, and old man, it is considerably less. It is influenced by different kinds of diet. Thus, M. Lehmann, in some experiments which he performed on himself, obtained from the urine which he passed during twenty-four hours, the following interesting results:—

| | Grains. |
|---|---|
| After a non-nitrogenous diet . . . . . . . | 237.909 |
| " a vegetable diet . . . . . . . . | 347.061 |
| " an animal diet . . . . . . . . | 821.270 |
| " a mixed diet . . . . . . . . . | 501.704 |

Urea is furnished sparingly in certain diseases, as in chronic inflammation of the liver, in granular degeneration of the kidney, in dyspepsia, pulmonary phthisis, gout, and intermittent fevers. Urea sometimes exists in excess. This state is usually combined with preternatural activity of the renal function, and can easily be recognized by mixing with the urine an equal quantity of nitric acid.

*Uric acid* generally greatly predominates in arthritic affections, as is shown by the formation of the earthy concretions, which are so frequently seen in the joints of the extremities, and which seem to be composed principally of the urate of soda, with a small quantity of the urate of lime. Gravel commonly consists of uric acid, and it is well known that this substance forms the basis of one of the most common varieties of urinary calculi. In diabetes mellitus, this acid is entirely absent, no trace of it whatever being discoverable by the most delicate tests. In some instances, this substance occurs in a free state; but most generally it appears in combination with an alkali; and, so long as this is the case, it does not yield a crystalline deposit.

A deficiency of *phosphoric acid* sometimes exists. When this is the case, the earthy materials are supposed to be converted into neutral salts, and then precipitated, so as to afford an opportunity for the formation of a stone.

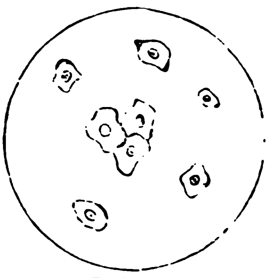
The *alkalies* which enter into the composition of this fluid are sometimes secreted in excess, and, by combining with the acid ingredients, may form salts, which on being deposited in the bladder, give rise to calculous concretions. This is especially the case with the lime and ammonia, the soda and potash producing little or no inconvenience.

Urine always contains, even in the healthy state, a small quantity of *mucus*, which, however, as it is perfectly transparent, does not become visible until after the fluid has stood some time in a tall, narrow glass vessel. It then presents itself near the bottom of the receiver, as a light but distinct cloud, which contrasts very strikingly with the clear supernatant fluid. It is always more or less transparent when moist, is not coagulable by boiling water, is soluble in caustic potash, and forms, on the addition of acetic acid, a thin, semi-opaque, corrugated, and characteristic pellicle. When dried, it has a peculiar shining aspect. Under the microscope, it is observed to have the same globular appearance as pus, but the particles are less numerous, and also less distinctly granular. They are suspended in a viscid, glairy fluid, sometimes combined with a minute trace of albumen. The urine with which the mucus is united is generally alkaline, and remarkably prone to decomposition, which not unfrequently takes place even in the bladder, especially if it be long retained.

The quantity of mucus is frequently much increased in disease. In cystorrhœa, for example, it is so abundant as to impart to the affection its distinctive character. An augmentation of quantity is usually associated with an augmentation of consistence. In chronic cystitis, attended with a copious secretion of mucus, the fluid is generally exceedingly tough and viscid, adhering tenaciously to the bottom and sides of the receiver, and allowing itself to be drawn out in long, stringy threads. It is, also, under these circumstances, not unfrequently associated with phosphatic deposits.

The lining membrane of the genito-urinary apparatus, like the external surface of the skin, is constantly engaged in throwing off *epithelial cells*, of variable size, and of an oval, or irregularly angular and flattened configuration, each having a well-marked central nucleus; sometimes they are broken up, and arranged in scales, patches, or lamellated plates. (Fig. 257.) They frequently occur in combination with oxalate of lime, and in certain affections, especially in Bright's disease, they contain fat-globules.

Fig. 257.



Epithelium.

2. The process of secretion, which is constantly going forward in the kidney, sometimes proceeds to a morbid extent, in consequence of which substances are generated which do not naturally occur in the urine. The most important of these, in reference to the pathology and treatment of diseases, are albumen, fibrin, the coloring matter of the blood, and pus. Other substances are occasionally observed, which get into the urine accidentally, and impart to it their peculiar properties. Of this description are the yellow matter of the bile, asparagus, oil of turpentine, and most of the balsamic preparations. Cantu detected mercury in the urine of persons who had been subjected to frictions with that substance, in the form of ointment; and the ferrocyanide of potash, tartaric acid, iodine, quinine, and a hundred other articles have been observed in this fluid, after they had been used as medicines.

In severe cases of jaundice, the *bile* passes from the blood into the kidneys, and communicates a yellow tint to the urine, at the same time that it renders it more acrid. The most delicate testof its presence is nitric acid, which causes either a green or brownish hue, according to the peculiar modification of the coloring principle of the foreign ingredient.

*Albumen* is frequently present in certain diseases, in large proportion. In the granular affection of the kidney it generally exists in considerable quantities, though it cannot be regarded as pathognomonic of that lesion, as it has been repeatedly observed in pneumonitis, dropsy of the abdomen, tubercles of the lungs, prurigo, and typhoid fever.

Albuminous urine is generally of low specific gravity, from deficiency of urea and salts, of a pale, opaline color, and readily coagulable on exposure to heat. The ferrocyanide of potassium, alum, and nitric acid will also curdle it.

The urine sometimes contains *fibrin;* probably, indeed, more frequently than is generally supposed. It appears to be occasionally present when there is apparently no morbid action. It is now and then associated with certain forms of dropsy; but how it is produced it is impossible, in the present state of our knowledge, to determine, as nothing is yet certainly known respecting it. In general, however, it depends, there is reason to believe, upon some structural disease of the kidney, or upon inflammation of the bladder, ureters, prostate gland, or urethra. In some cases of this kind there are large cells, from $\frac{1}{1500}$ to $\frac{1}{1000}$ of an inch in diameter, full of granules, and with or without a distinct nucleus. These appearances are well represented in Fig. 258.

Fig. 258.

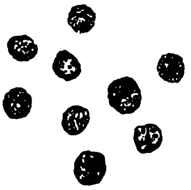
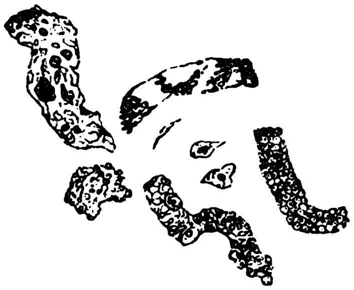


Fig. 259.



Casts of the *uriniferous tubes* are also sometimes present in the urine; generally in combination with pus-corpuscles, epithelium, blood-disks, or oil-globules. Their appearance is usually denotive of serious organic lesion of the renal tissues, especially when they are associated with fatty matter. The microscopic characters of these deposits are exhibited in the adjoining sketch (Fig. 259).

The urine not unfrequently contains pure *blood.* This may be owing to various causes, the most common of which are external violence, eventuating in a laceration of some of the vessels of the genito-urinary apparatus, the passage of a renal calculus, ulceration of the mucous surfaces, and the presence of encephaloid, fungous, or erectile tumors. Occasionally, though rarely, the fluid is the result of a process of exhalation.

When the blood exists in large quantity, its presence is, in general, easily detected by the peculiar color which it imparts to the urine, by its tendency to subside to the bottom of the receiver, and by its alkaline properties. The readiest and most infallible mode, however, of discriminating between it and other substances is to examine it with the microscope. For this purpose, a minute portion of the suspected fluid is placed in a watch-glass in the field of the instrument. If it be of a bloody character, it will be found to contain a great number of corpuscles, which, although usually somewhat altered in shape, are yet sufficiently characteristic. When the blood is very recent, or has not been acted upon much by the urine, it generally retains its normal appearance, and is consequently more easily distinguished. Fig. 260 represents the blood-corpuscles in an aggregated, and Fig. 261 in a separate state.

Fig. 260.

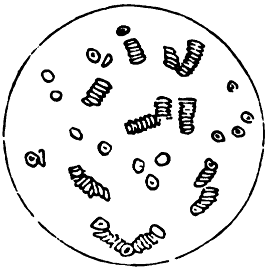
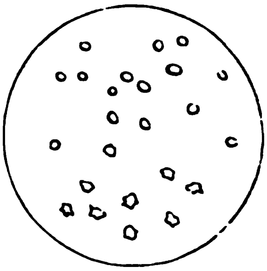
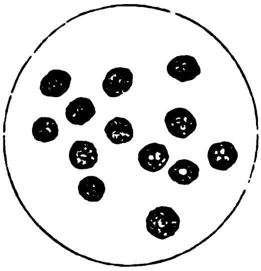


Fig. 261.



*Pus* is a very frequent ingredient of urine, and is generally denotive of organic lesion of the genito-urinary apparatus. Its admixture may, however, be purely accidental, as when it is caused by the bursting of an abscess into the bladder, or the pelvis of the kidney. The urine with which the pus is combined always contains albumen, is indisposed to putrefy, and is generally acid or neutral; when first voided, it is more or less turbid, but it soon assumes a pale appearance, though it never becomes perfectly transparent.

Fig. 262.

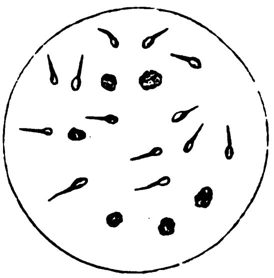


By repose, the pus falls to the bottom of the receiver, where it forms a dense homogeneous stratum, of variable thickness, and of a yellowish-white or greenish-yellow tint. Under the microscope, it exhibits the appearance of spherical corpuscles (Fig. 262), floating in an albuminous fluid, opaque, white, rough on the surface, and more than one-third larger than the red particles of the blood. By agitation it readily mixes with the urine, to which it imparts its peculiar color, but is not dissolved in it.

A substance, termed *kiesteine*, is occasionally found in the urine. It was supposed, at one time, to be peculiar to pregnant women, but it has been ascertained to be generally present also during the early months of lactation, and sometimes also in the virgin state. When first observed it usually presents itself in the form of little, isolated patches, which gradually coalesce, and form a pellicle, from half a line to a line in thickness, of a whitish opaline tint, not unlike the greasy scum upon the surface of fat broth. Dr. Elisha K. Kane, who carefully investigated the physical properties of this substance, states that it occasionally makes its appearance in striated, irregular lines, somewhat similar to those of a spider's web, in rings, circles, trapeziums, and irregular figures of almost every shape, which become gradually obscured by the full development of the pellicle. It consists of a filamentous, flaky tissue, and is so coherent that it may occasionally be lifted off entire from the fluid which it covers. A portion of this substance commonly subsides, and forms a thin, bluish, or whitish layer at the bottom of the vessel.

The urine sometimes contains seminal fluid. If a drop of it be placed under the microscope, it will be found to consist of numerous *spermatozoa*, which, however, rarely retain their vitality beyond a few minutes, inasmuch as the urine proves almost immediately fatal to them. These animalcules present themselves as minute ovate, semi-transparent bodies, having each a delicate hair-like tail (Fig. 263), which is capable of very brisk movements, and which becomes always much more distinct when the urine is permitted to dry upon the object-glass.

Fig. 263.



3. In the third place, the urine may be altered by the ingress of substances which, so far as we know, are not naturally contained in the blood. Amongst these, the most common are the cystic and xanthic oxides, oxalic acid, and a peculiar saccharine substance, like the sugar of grapes. The cystic and xanthic oxides are never observed in healthy urine; they form the base of several varieties of vesical concretions, but the causes which predispose to their development are still unknown. Oxalic acid is more frequently seen, and is often traceable to articles of diet which naturally possess a large quantity of this substance.

An abundant secretion of *sugar* is a circumstance by no means uncommon. In diabetes mellitus, where it is generally present in large proportion, it forms the characteristic feature of the disease. The urine in this complaint is commonly of a pale straw-color, of a faint, whey-like odor, and of a decidedly saccharine taste; it has a greater specific gravity than in health, yields a syrup by evaporation, has little tendency to putrefy, and is susceptible of undergoing the vinous fermentation. Diabetic urine almost always contains the usual proportions of saline matters; but, in the majority of cases, there is a great deficiency of urea and lithic acid.

Though *oil* is not contained in healthy urine, it is found in certain diseases. In one instance, Prout observed a substance like butter; and, in some cases, the fluid has the aspect of milk.

The urine is occasionally of a *bluish* tint, owing to the presence of a peculiar coloring matter, which it holds in suspension. This substance, whatever may be its nature, is slightly soluble in boiling water and alcohol, has neither taste nor smell, and is entirely destroyed by nitric acid. Exposed to heat, it yields carbonate of ammonia and an empyreumatic oil.

The urine may likewise be of a *black* color, from the presence of melanic acid. When this substance is very abundant, the fluid has sometimes the appearance of black ink, or may be made such by the addition of an alkali. More frequently, a pink color is observed, owing to the presence of purpurine.

Lastly, the urine may contain *hairs*, generally of a whitish color, destitute of bulbs, and not more than a few lines in length. They may be soft or hard, straight or curled, abundant or few in number.

4. The urine is liable to vary very much in its quantity, color, and odor. The average *quantity* discharged in the twenty-four hours varies from 30 to 40 ounces. More is voided in cold than in warm weather. Huge feeders and drinkers pass more than the abstemious, and are, for this reason, more liable to renal disease. Severe exercise, and all inflammatory affections are attended with a diminished flow; the reverse being the case in repose, and in what are denominated nervous diseases, in which the quantity is often immense. In diabetes, from one to two gallons of urine are frequently voided, for weeks together, in the twenty-four hours. Diuretic medicines, as their name implies, act specifically upon the kidneys, and thus increase their secretion. It is worthy of remark that the approach of most inflammatory maladies is accompanied by a diminution, and the decline by an augmentation, of the renal secretion.

When the urine is unusually scanty, it generally contains a disproportionably small amount of water; its specific gravity is abnormally high, and its color is deeper than in the healthy state.

It is well known that the urine is of a much higher *color*, as well as of greater specific gravity, in warm weather than in cold, and in strong, healthy, and robust persons than in such as are thin, feeble, and anæmic. During the heat of summer, the renal secretion is constantly counteracted, as it were, by the cutaneous, and the consequence is that it is not only considerably lessened in quantity, but materially heightened in color, the reverse being the case in cold weather. The urine is always of a deeper tint after severe exercise than after repose, after a hearty meal of meat than after one of vegetables, and after the use of brandy, wine, or malt liquors, than after the imbibition of water, tea, or milk. It is also of a higher color, generally speaking, in young and middle-aged persons, than in children and old subjects, in whom it is usually pale, dull, and cloudy. In inflammatory affections, as the different forms of fever, gout, rheumatism, pneumonia, pleurisy, and erysipelas, the fluid is always abnormally red, and frequently also turbid, from the presence of animal and earthy matter. It has less water, but more lithic acid, is of higher specific gravity, and often contains a small quantity of albumen.

The urine is generally clear, and even remarkably limpid in nervous affections, as in hysteria, epilepsy, and hypochondriasis. The quantity in attacks of this kind is often very great, and the fluid is generally very thin and of low specific gravity. In diabetes, in which the urine is often thrown off in vast abundance, the color is usually very pale.

In jaundice, the urine often acquires a golden yellowish tint, and a somewhat similar effect is produced by the use of saffron, rhubarb, and turmeric. Beet-root renders the fluid red; mulberries and black cherries, dark; chalybeates, blackish. Infusions of madder, indigo, and logwood impart to the renal secretion their peculiar hue. Urine depositing cystine generally exhibits a pale yellow color, similar to that of honey.

The *odor* of the urine is liable to great variation, a circumstance deserving brief mention on account of its diagnostic bearing. In the healthy state, it is slightly aromatic, without acidity, alkalinity, or fetor of any kind; in fact, it strikingly resembles the odor of the perspiration of a sound person. In certain diseases, on the contrary, it often becomes remarkably offensive, acquiring an ammoniacal odor, even before it is voided.

Certain articles of diet exert a powerful influence upon the odor of the urine. It has long been known that asparagus, garlic, onions, cauliflower, and other vegetable substances have the faculty of imparting their peculiar odor to the renal secretion. Similar effects follow the exhibition of certain medicines, as oil of turpentine, copaiba, cubebs, fennel, valerian, castor, assafœtida, saffron, and other articles. Gin acts specifically on the kidney, and readily communicates its smell to the urine.

The *density* of the urine is liable to be influenced by various circumstances, as the age of the patient, the amount of perspiration, the nature of the diet, the state of the weather, and the character of the particular disease under which the individual may be laboring.

15. *Urinary Deposits.*—The urine is liable to various deposits, of which the most important are the lithic, oxalic, and phosphatic.

I. The *lithic deposit*, as being the most common of all, may be considered first. It derives its name from the circumstance that it enters largely into the composition of several varieties of urinary calculi. It is often called the uric deposit. Lithic acid is a peculiar animal substance, which contains a considerable quantity of nitrogen, and is easily soluble in a solution of caustic potassa, but insoluble in water. It is dissolved by nitric acid with effervescence; and before the blowpipe it emits a disagreeable fetid smell, similar to that of burnt horn, with a combination of hydrocyanic acid. This is owing to the fact that it is always united in the urine with ammonia, with which it forms a salt, the superlithate of ammonia, the acid being in excess. In the natural state of the urine, the acid is held in perfect solution, but in certain morbid conditions of this fluid, or when the acid is secreted in excess, it is thrown down in the form of amorphous sediments, or crystalline salts. The urine depositing lithic acid always reddens litmus paper, and its specific gravity is generally over 1.020. It frequently contains an excess of urea, and when this is the case it crystallizes slowly when mixed with nitric acid in a watch-glass.

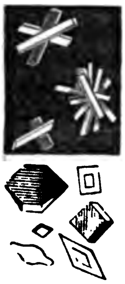
Of the amorphous *sediments*, there are two, the yellow and the red, their names being derived from the peculiarity of their color. They consist of lithic acid in combination with ammonia, are readily dissipated by heat, and never appear in the urine until after it has cooled.

The *yellow sediment* consists almost wholly of the lithate of ammonia, tinged with the coloring matter of the urine. In its complexion, it runs through almost every intermediate shade between a pale fawn and a deep orange. In some instances it is nearly entirely white. It is of very frequent occurrence, and often disappears with great rapidity, to reappear, perhaps, almost immediately from the slightest causes. Heat readily dissolves it; and the addition of a drop of nitric acid causes a deposit of numerous crystals. The urine which furnishes this substance is of a pale amber tint, more or less acid, and clear when voided. Its quantity is commonly confined within the natural limits, and its specific gravity ranges from 1.015 to 1.025. The yellow deposit is very common in children, and frequently alternates with the crystalline sediment.

The *red sediment* is composed of lithate of ammonia, in union with a peculiar coloring pigment, to which Dr. Bird has applied the term purpurine. This coloring matter is of a highly carbonaceous character, and is always present in those states of the system which are attended with imperfect assimilation, or a want of proper aeration of the blood. This form of sediment varies in its tint from a pale pink to a deep purple, according to the amount of purpurine present in the urine. A very frequent species is the *lateritious*, or brick-dust sediment, so common in fever, rheumatism, and gout. The *pink* sediment is merely a variety of this; it is exceedingly rare. When there is an excess of purpurine, the deposit is sometimes of a deep purple color, not unlike that of the blood.

The urine depositing this sediment is of a red, or brownish color, preternaturally acid, and of high specific gravity, ranging from 1.025 to 1.035. Its quantity is ordinarily considerably below the normal standard. By adding to it a drop of nitric acid, it generally becomes turbid, from the precipitation of lithic acid.

Fig. 264.

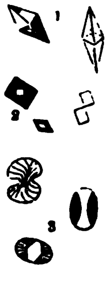


The *crystallized sediments*, red sand, or gravel, consist of lithic acid, nearly in a pure state. They appear in the form of minute particles, resembling very much, in shape, size, and color, the particles of Cayenne pepper. Heat does not dissolve them, as it does lithate of ammonia. Under the microscope, they are found to consist of exceedingly delicate crystals, most of which have the appearance of rhombic prisms, which may, therefore, be assumed as their normal form. The most perfect specimens are generally contained in the deposits of yellow sand in the urine of young infants. The crystals are sometimes nearly square; or they are very thin, and longer than broad, so as to represent square tables; or finally, they are so thin as to appear merely like pale lozenge-shaped lamellæ. Occasionally they lie across each other, and are firmly coherent. These varieties are well shown in the adjoining cut.

The color of this crystallized substance is subject to considerable diversity. When the deposit is unaccompanied by fever, it is usually more or less yellow; but when the reverse is the case, it is pale red, lateritious, brick red, or brownish. A pink tint is exceedingly rare. The urine from which the matter is precipitated, is generally scanty, deep-colored, acid, and of high specific gravity. The quantity of this deposit is sometimes astonishingly great. I have seen cases in which it was discharged to the extent of four or five drachms a day for many weeks.

II. The *oxalic deposit* holds, in point of frequency, an intermediate rank between the lithic and phosphatic. It occurs in the form of a white, glistening powder, which is suspended in the urine, and manifests no disposition to precipitate itself, unless it can attach itself to some substance capable of constituting a nucleus. Examined with the microscope, this powder is found to consist of beautiful transparent crystals, of an octohedral figure, with sharp and well-defined edges and angles. Occasionally, though rarely, they are shaped like dumb-bells, or like two kidneys united at their concavities, and so closely approximated as to appear almost circular.[1] (Fig. 265.) They vary much in their size, but in general they are exceedingly minute. If they are subjected to ignition on platinum foil, the oxalic acid is decomposed, and a small quantity of carbonate of lime is left, which is readily dissolved with effervescence on the addition of dilute nitric acid. Oxalic acid sometimes occurs as a distinct deposit, in the form of a small concretion resembling a hemp-seed, which may be retained in the bladder, and go on gradually increasing until it constitutes a mulberry calculus.

Fig. 265.

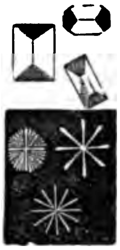


*Urine* containing oxalic acid is generally of a distinct amber color; occasionally it is preternaturally dark or pale. Its specific gravity, which is extremely variable, ranges from 1.015 to 1.025, and is usually greatest in night specimens. The fluid is always decidedly acid, and very frequently contains slight traces of lithic sediment, urate of ammonia, or triple phosphate.

III. The *phosphatic deposit* is characterized by its whitish color, by its pulverulent arrangement, by its solubility in dilute hydrochloric acid, and by its insolubility in ammonia and solution of potash. It presents itself under three distinct varieties of form, the triple, the calcareous, and the mixed, each of which demands succinct notice in this place.

1. The *triple phosphate* consists of phosphate of ammonia and magnesia, on which account it is generally called the ammoniaco-magnesian phosphate. It commonly occurs in minute white crystals, of a beautifully brilliant aspect, transparent or opaque, and remarkable for their sharp angles and edges. In their form, these crystals exhibit great diversity; but in most cases they are prismatic. Occasionally they have a stellar, penniform, or foliaceous arrangement.[2] (Fig. 266.) They often float on the surface of the urine, especially if it is partially decomposed, and look like an iridescent film of grease. The urine which accompanies this deposit is preternaturally copious, pale, or whitish, and of low specific gravity, ranging from 1.005 to 1.014. It has a faint, sickening smell, which soon becomes ammoniacal and offensive, is very feebly acid, and scarcely, if at all, reddens litmus paper. In some affections, the fluid is unna-

Fig. 266.



---

[1] Bird, on Urinary Deposits, p. 184. Phila., 1854.
[2] Bird, *op. cit.*, p. 227. Phila., 1854.

turally dark, brownish, or greenish-brown, decidedly alkaline, and loaded with dense ropy mucus. The triple phosphatic deposit very often alternates with the yellow lithic or calcareous deposit.

2. The *calcareous deposit* is composed of phosphate of lime, and occurs in the form of an impalpable powder, of a whitish, grayish, or drab color. Occasionally it is more or less dark, from the admixture of the coloring matter of the urine. The urine, as in the triple variety, is pale, copious, and of low specific gravity, and readily decomposed by exposure to the atmosphere.

3. The *mixed deposit*, consisting of a combination of the two preceding, is very common, and is supposed to be the result of the joint agency of the kidney and the lining membrane of the urinary passages. The earthy matter is of a whitish color, partly amorphous, and partly crystallized, and is usually intermixed with mucus, which is often secreted in large quantity, and of a ropy, viscid character. The urine is fetid, pale, and abundant, and deposits a thick mortar-like sediment upon standing.

16. *Calculi.*—The number of urinary calculi is extremely variable. Very frequently there is only a single one, whilst at other times there are a great many. Sir Astley Cooper met with one hundred and forty-two; Desault with two hundred; Boerhaave with three hundred; Murat with six hundred and seventy-eight; and Physick with upwards of one thousand. This case occurred in the person of the late Chief Justice Marshall, and is perhaps the most remarkable of the kind on record. The concretions were all of an oval shape, and varied from the volume of a partridge-shot to that of a bean. When numerous, they are always more or less polished, from continued friction against each other; and, although they generally lie perfectly loose in the bladder, they are sometimes encysted, impacted in the urethra, or lodged in the ducts of the prostate. These concretions are of all sizes, from a hemp-seed to that of the fist; in their weight, they vary from a few grains to a pound or more, their average being from two drachms to an ounce.

Urinary concretions are generally classed under different heads, according to their color, consistence, and intimate characters. The subjoined arrangement includes the most important species that have hitherto been described.

The *uric* calculus, the most common species of all, is of a brownish color, inclining to that of mahogany, of a flattened, oval shape, occasionally finely tuberculated on the surface, but most generally smooth, though not polished, unless there are several concretions at the same time, and from the size of a currant to that of a hen's egg. If it be divided with the saw, it will be found to consist of several layers arranged concentrically around a common nucleus, the laminæ being frequently distinguishable from each other by a slight difference in color, and sometimes by the interposition of other ingredients. Water has but little action upon it; it is perfectly dissolved by caustic potash; and disappears with effervescence in hot nitric acid, the solution affording, on evaporation to dryness, a bright carmine-colored residue; before the blowpipe, it becomes black, emits a peculiar animal odor, and is gradually consumed, leaving a minute quantity of white, alkaline ashes. Fig. 267 shows the oval shape and finely tuberculated surface of the calculus; Fig. 268 the internal concentric layers.

Fig. 267.

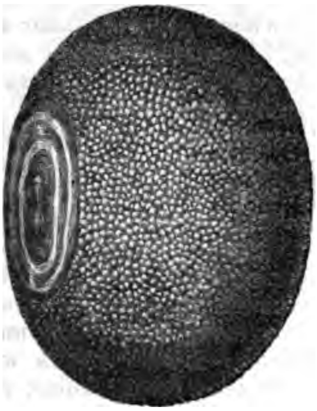
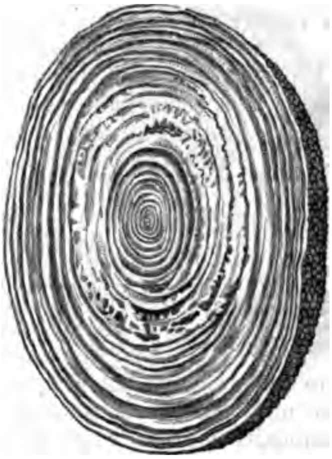


Fig. 268.



The *uro-ammoniac* calculus is a variety of the preceding. It is principally observed in children, and is so extremely rare that several distinguished chemists have been induced to deny its existence. It is generally of small size, with a smooth surface, of a clay color, and composed of concentric rings, which present a very fine earthy appearance when fractured. Much more soluble in water than the uric calculus, it gives out a strong ammoniacal smell when heated with caustic potash, and deflagrates remarkably below the blowpipe.

Next to the uric calculus, in point of frequency, is the *oxalic*, which is generally of a dark brown color, rough and tuberculated on the surface, very hard, compact, and imperfectly laminated, seldom larger than a walnut, spherical, and always single. Under the blowpipe, it expands and effloresces into a white powder; it dissolves slowly in

Fig. 269.

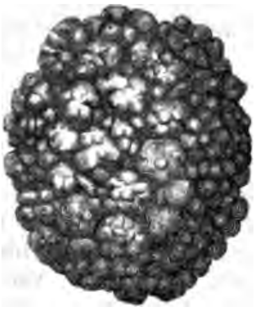
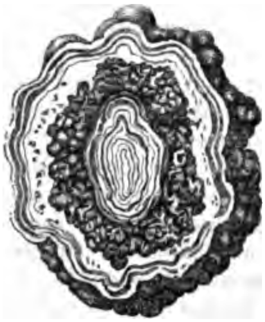


Fig. 270.



muriatic and nitric acid, provided it be previously well broken up. In the alkalies, it is perfectly insoluble. This species of urinary concretion, called by many the *mulberry* calculus, from its resemblance to the fruit of the mulberry, consists essentially of oxalate of lime. Figs. 269 and 270 show the external appearance and internal structure of this concretion.

A variety of this species of calculus has been described by the term *hemp-seed*, from some resemblance which it bears in color and lustre to that substance. (Fig. 271.) It is always of small size, remarkably smooth, and generally exists in considerable numbers, being rarely, if ever, found alone.

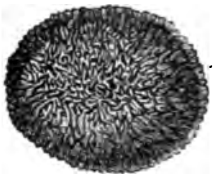
Fig. 271.

The *phosphatic* calculus (Fig. 272), is of a pale brownish color, and of a loosely laminated structure, with a smooth, polished surface, like porcelain. The shape is mostly oval, and the size, though generally small, is sometimes very considerable. It whitens when exposed to the blowpipe, but does not fuse; and readily dissolves in muriatic acid, without effervescence. This calculus, composed essentially of phosphate of lime, is extremely rare, as forming entire concretions, but frequently constitutes alternate layers with other matters. It is sometimes called the *bone-earth* calculus, and occasionally contains small quantities of carbonate of lime.

Fig. 272.

The next species is the *ammoniaco-magnesian*, so called from its being composed of the phosphate of ammonia and magnesia. (Fig. 273.) This mixed calculus is of a white color, friable, crystallized on the surface, and looks a good deal like a mass of chalk; its texture being never laminated, it easily dissolves in dilute acids, but is insoluble in caustic potash; before the blowpipe, it exhales an ammoniacal odor, and at length melts into a vitreous substance. This species of concretion sometimes attains an immense size.

Fig. 273.



The *fusible* calculus consists of a combination of the last two. It is of a white color, extremely brittle, leaves a soft dust on the fingers, and is easily separated into layers; when broken, it presents a ragged, uneven surface. It is insoluble in caustic potash, but gives off ammonia; and, under the blowpipe, it is readily converted into a transparent, pearly looking glass. This concretion is very common, and sometimes attains a very large size. It is frequently met with as an incrustation of foreign bodies. Figs. 274 and 275 exhibit the outer appearance and internal structure of this concretion.

The *cystic* calculus is a very rare species of concretion, so called from an erroneous supposition that it was peculiar to the bladder. It consists of a confused, crystallized mass, of a white, yellowish color, with a smooth surface. The structure is compact, and the fracture exhibits a peculiar glistening lustre, like that of a body having a high refractive density. It exhales a strong characteristic odor under the blowpipe, and is very abundantly dissolved in acids and alkalies, with both of which it crystallizes. This species is commonly of an irregular, spherical shape, and seldom attains a large volume.

Fig. 274.

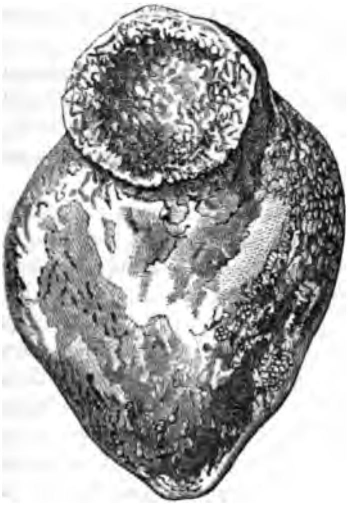
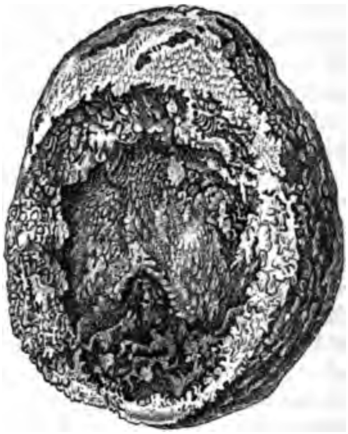


Fig. 275.



The external and internal appearances of the cystic calculus are shown in Figs. 276 and 277.

The *xanthic* calculus is extremely rare. Its texture is compact, hard, and laminated: its color is of a cinnamon brown, its surface smooth, and its volume small. It dissolves very readily in acids and alkalies, and is gradually consumed before the blowpipe, leaving a minute quantity of white ashes.

Fig. 276.

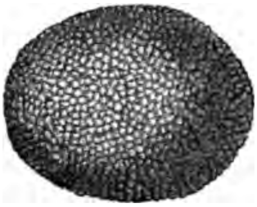
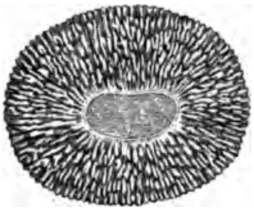


Fig. 277.



There is, lastly, what is called the *fibrinous* calculus. Like the preceding species, this is also extremely rare, and appears to be composed principally of the fibrin of the blood, a property to which it owes its name, and by which it is characterized. It is of small size, of a spherical or oval shape, and of a brownish color. When dried, it shrinks, and loses some of its weight.

Most calculi are formed in the kidneys, whence they descend into the bladder, where they gradually acquire the characters that have just been ascribed to them; but at other times they take their origin entirely in the urinary reservoir, and not unfrequently they grow around a foreign body as their central nucleus. A substance like mortar is occasionally contained in the bladder, filling up a large portion of its cavity. It is of a pale yellowish color; is composed principally of phosphate and carbonate of lime; and is usually connected with chronic inflammation of the lining membrane, leading to effusion of lymph. Hair is sometimes found in the softer varieties of urinary calculi, but this is very rare. The immediate cause of the formation of vesical calculi consists in the inordinate deposition of the earthy salts of the urine, which, instead of being discharged with that fluid, sink to the bottom of the bladder, and so become the nuclei around which the accretion gradually takes place.

Almost any foreign substance, as a drop of blood, a mass of inspissated mucus, a shot, or a ball, may serve as a nucleus for calculous concretions. In my private collection is a specimen, presented to me by Dr. Jetton, of Tennessee, which contained three of the caudal bones of a squirrel. The supposition is that the man, who was thirty-five years of age, had been in the habit of exciting onanism with the tail of this animal, and that in one of these attempts a portion of it broke off, and slipped into the bladder. A considerable number of examples, in which bits of catheters, seeds of vegetables, fruit stones, pins, bodkins, and even needles, formed the centre of urinary calculi, are upon record. Such cases are, for obvious reasons, more frequent in the female than in the male.

## SECTION V.

### PROSTATE GLAND.

1. *Acute inflammation* of the prostate is a rare disease, especially in the young. Its anatomical characters are increased vascularity, slight discoloration, tumefaction, and preternatural lacerability. The swelling, in the milder forms, depends mainly upon an effusion of serum into the meshes of the cellular tissue of the organ, and upon the dilated condition of its vessels. When the inflammation is more violent, there is, in addition, a deposition of coagulating lymph, of blood, and even of pus. The latter fluid generally exists in minute, disseminated points, not larger than a pin's head, and of a pale straw color. They are most conspicuous in the cellular substance of the organ, a section of which, when thus affected, bears a tolerably close resemblance to the pulmonary tissues in a state of grayish hepatization.

The gland is red, and infiltrated, but still retains its cohesive properties; it is only in the advanced stages of the disease that it becomes soft and friable. The mucous follicles are enlarged, injected, and distended with a thick ropy secretion; the excretory ducts, on the contrary, are generally diminished in size, and sometimes even obliterated by the adhesion of their sides. Occasionally they yield, upon pressure, a thin, bloody, and slightly viscid fluid. The fibrous capsule is unnaturally red and vascular, tense, and covered, here and there, with plastic deposits. The size of the gland varies, in different cases, from the slightest increase of the natural bulk, to the volume of a walnut, a hen's egg, or an orange. The swelling generally involves both the lateral lobes, though not in an equal degree. The middle lobe is also frequently much enlarged. The parts adjacent to the prostate usually participate in the morbid changes. Acute inflammation of the prostate may terminate in suppuration and ulceration, or pass into the chronic form. Of gangrene of this organ, as an idiopathic lesion, nothing is known.

2. *Suppuration* is commonly the result of acute inflammation, although occasionally it supervenes upon the chronic form of the disease. The matter, which is ordinarily of a thick, creamy consistence, and of a pale straw color, is either diffused through the substance of the gland, or, as more frequently happens, it is collected into little abscesses, which have a natural tendency to burst into the urethra, the bladder, or the rectum. In some instances the fluid finds an outlet through the perineum. Occasionally the abscesses attain a very considerable size, containing from one to three ounces of pus. Suppuration of the gland is seldom seen before the age of twenty; but from this period on it is not infrequent.

3. *Ulceration* of the prostate is uncommon. It is usually produced by the presence of calculous matter, lodged either in its own substance or at the neck of the bladder. The erosion, which varies in size and depth, is usually seated upon the vesical surface of the gland, and is characterized by great hardness and irregularity of its edges. When very extensive, it may become the seat of hemorrhage, more or less copious, and sometimes even exhausting.

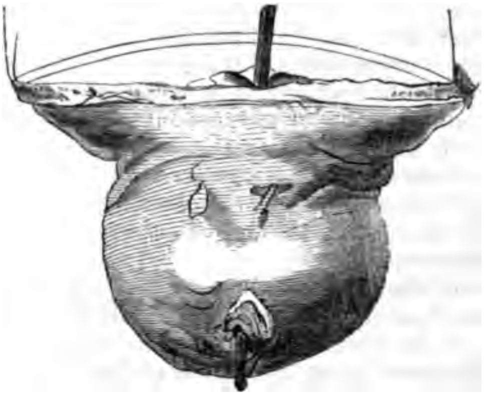
4. *Chronic inflammation* of the prostate is much more common than the acute, of which it is occasionally a result. More frequently, however, it is brought on by calculous disorders, stricture of the urethra, excessive venery, or disease of the rectum and anus. However induced, it is very apt to be easily re-excited by the most trivial causes, resembling, in this respect, chronic inflammation of the tonsils. Its principal anatomical characters are increase of volume of the organ, and more or less induration of its component elements, phenomena which will claim special consideration under the head of hypertrophy, a not unfrequent product of this disease.

5. *Hypertrophy* of the prostate exists in various degrees, and may affect the entire organ, or only a part of it. In general, it involves both the lateral lobes, as they are termed, though rarely in the same degree. Occasionally, however, it is almost entirely limited to the third lobe. In the former case, the greatest increase of volume usually occurs in the long axis of the organ, in consequence, no doubt, of the want of resistance in this direction. Under these circumstances, the lateral lobes are of an elongated, oval shape, generally larger in the middle than at the extremities, convex in front, and rather compressed behind. (Fig. 278.) When, on the contrary, the hypertrophy advances equally in all directions, these bodies will be apt to be somewhat obround, or like the longitudinal section of an orange. Enlargement of the gland

in front and below is opposed by the elevator muscles of the anus, the deep perineal fascia, and the pubic bones. Occasionally the organ increases more in the transverse than in the vertical diameter, extending outwards toward the sides of the pelvis, and thus overlapping and compressing the rectum.

When the lateral masses are equally enlarged, they frequently project inwards towards the median line, so as almost to touch each other. This occurrence, however, is rare, and is met with only in the more aggravated forms of the malady. More commonly there is a small interval between them, representing the appearance, when the gland is laid open longitudinally along its pubic surface, of a median groove or gutter. When one lateral lobe is more enlarged than the other, the more bulky one frequently encroaches more or less upon the smaller one, and thus produces a lateral curvature, or a change in the direction of the neck of the bladder, and the commencement of the urethra. Again, it occasionally happens that one lobe projects over on one side, and the other on the opposite, giving rise thereby to two curvatures instead of one, as in the former case.

Fig. 278.



Whatever may be the shape of the enlarged masses, or the direction in which the hypertrophy occurs, their surfaces, both external and internal, may be perfectly smooth, or they may be more or less irregular, knotty, and even lobulated. Sometimes small prominences exist upon them, attached by a broad base, and evidently prolonged from their substance, which they resemble in color and structure. Fig. 279, from a specimen in my collection, exhibits this form of the enlargement. Several such bodies are occasionally found close together, thus producing a lobulated appearance. Cysts sometimes form in the enlarged masses, from the size of a pea up to that of a large marble, filled with serous fluid, and lined by a sort of false membrane. Finally, the surface of these bodies is occasionally excoriated, fissured, and even ulcerated.

When the *middle lobe* is hypertrophied, it generally forms a sort of mammillary process, which is more or less vertical in its position, and varies in size from that of the female nipple to that of a pullet's egg. (Fig. 280.) The apex of the tumor is free and rounded, while the base is immovably fixed, and rests as it were upon the posterior extremity of each lateral mass. Its position is usually median; but sometimes I have found it to project more to one side than the other, and thus create an additional impediment to the introduction of the catheter.

Fig. 279.

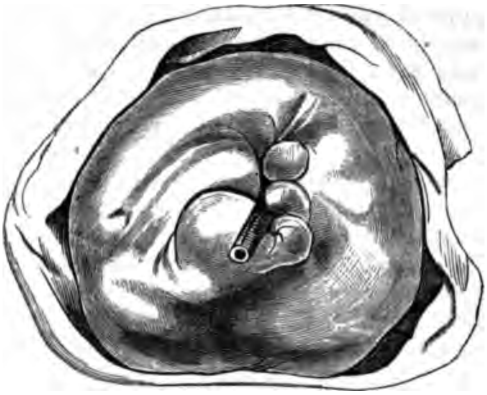


Fig. 280.

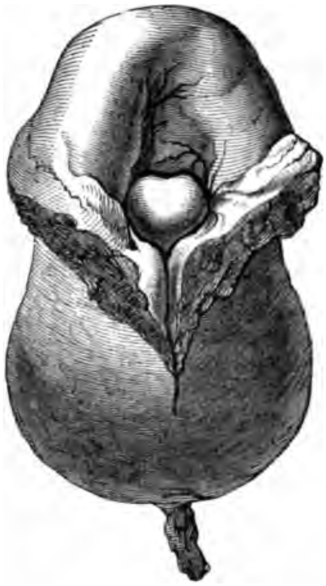
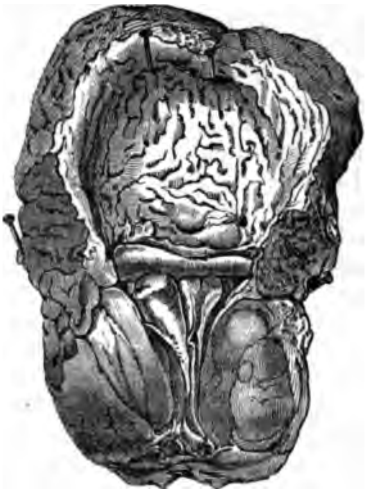


Fig. 281.



Although the form of the third lobe, when hypertrophied, is generally as here represented, cases occasionally occur in which it is exceedingly irregular, setting everything like accuracy of description at defiance.

Next to the mammillated variety, according to my observation, is the triangular, in which the tumor is large behind and narrow in front, terminating in a tolerably sharp crest. More rarely it is of a rounded shape, or broad and convex on its free surface, and adherent by a small pedicle. I have seen specimens in which the swelling consisted of three oblong bodies, placed side by side, as in Fig. 281, from a specimen in my private cabinet; and examples are recorded, in which there were as many as four and even five such lobes. Whatever be the form and volume of the tumor, it always projects towards the bladder, drawing up the prostatic portion of the urethra, and elongating the verumontanum.

The consistence of a hypertrophied prostate is liable to considerable diversity, and occurs under two very opposite forms, the hard and the soft. In the first, the more frequent of the two, the induration varies from the slightest increase of the natural consistence to the firmness of the fibrous tissue. It was owing, no doubt, to this circumstance that the older pathologists were so constantly in the habit of considering this affection as being of a scirrhous character; an error, not perhaps entirely exploded at the present day. When the induration exists in a high degree, the affected part tears with difficulty, and offers considerable resistance to the scalpel; but does not yield a crepitating sound. Interspersed through its substance are numerous granulations, of a grayish color, rounded or oval in their shape, and hardly as large as a millet-seed. They are inclosed each in a cellulo-fibrous capsule, to which they adhere by a delicate pedicle, and from which they may be easily enucleated. A section of the gland exhibits a rough, irregular surface, caused by the manner in which the granulations project from the cells or lodges in which they are naturally embedded. By pressure, a thin, milky fluid is obtained from it, which is probably merely the prostatic liquor, somewhat altered in its properties and slightly increased in quantity.

In the soft variety, the enlargement proceeds in a more uniform manner, and attains, as a general rule, a greater magnitude than in the hard. The affected tissues are more or less elastic, and yield readily under the pressure of the finger. The granulations, larger and more conspicuous than in the first variety, are of a soft, spongy texture, and of a whitish or grayish aspect. By a little care they can be easily separated from their cellulo-fibrous capsules, when it will be found that their principal bond of union is a delicate pedicle, through which they receive their bloodvessels, nerves, and lymphatics. Their shape is the same as in the hard variety, and the fluid which exudes from them, on pressure, is a little more abundant, and of an opaque, milky, yellowish, or brownish hue.

The nature of the granulations above described is not well ascertained. It is highly probable, however, that they are nothing but the terminal follicles of the prostate, in a state of enlargement and partial occlusion. The capsules in which they are inclosed are of a dense, fibrous structure, and are evidently formed out of the natural fibrous element, very much hypertrophied. The lesion bears the greatest analogy to cirrhosis of the liver.

The color of the affected gland varies in the different periods of life, from circumstances directly dependent upon its nutritive functions. In senile hypertrophy, which generally takes place under the influence of causes operating in a slow and gradual manner, there is usually a diminution of color, in consequence, apparently, of the concomitant compression of the capillary vessels which ramify through the substance of the organ. Hence, if a section be made of the parenchymatous structure, the surface will be seen to be of a dull grayish, light ash, or pale drab tint, and to emit hardly any blood on pressure. When the hypertrophy is produced and kept up by irritation, there is sometimes an increase of color, and an augmented capillary circulation. Under such circumstances, the parenchymatous substance may exhibit various shades of red and brown, and afford a considerable quantity of blood under pressure and maceration.

Hypertrophy of this gland is one of the effects of old age. Hence it is generally known by the term *senile*. After the age of fifty, there are probably few persons who are entirely exempt from it. When dependent upon causes of this kind it generally advances very tardily, and, at times, even remains temporarily stationary. The inflammatory form, on the contrary, progresses more rapidly, and often attains a considerable bulk in a few months.

6. The prostate is liable to *atrophy*, sometimes as an effect of old age, but more generally as the result of mechanical compression, such, for example, as that produced by the presence of a calculous concretion. The extent of the atrophy varies; thus, it may involve the entire gland, one of its lobes, or only a part of a lobe. In extreme cases the proper structure is almost entirely effaced, and hardly anything remains but its fibrous capsule. In the more ordinary forms, however, the gland is only somewhat reduced in bulk, preternaturally firm, and of a paler color than in the normal state. The cellular element is wanting, being superseded by the fibrous.

7. *Fibrous tumors* of the prostate vary in their volume from that of a pea to that of a small almond; they are of a rounded, spherical, or ovoidal form, of a firm, dense consistence, and of a dull, grayish color. They are usually situated on the outer surface of the gland, but occasionally they project inwards, so as to encroach upon the urethra and the neck of the bladder. In the few cases in which I have observed these tumors, they were solitary ; sometimes, however, there are as many as three or four. When they are seated upon the periphery of the organ, they give it a rough, knobby, or nodulated appearance. They usually grow from a broad base, which seems to be insensibly lost in the proper glandular substance. A section of these tumors displays a grayish or drab-colored tissue, of a tough, inelastic character, having little moisture, and but few vessels.

Fibrous tumors of the prostate bear a strong resemblance, both in their situation and structure, to fibrous tumors of the uterus. They are always associated with hypertrophy of the gland, and are rarely found, except in old subjects, who have long labored under organic disease of the urinary apparatus. They are probably developed under the influence of chronic irritation, leading to irregular, local, or circumscribed supernutrition of the parenchymatous structure.

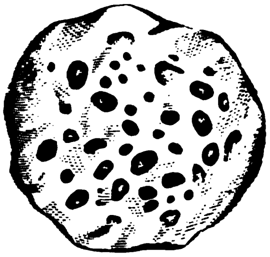
8. The prostate is occasionally the seat of *tubercles*. Of this disease I have seen but one example, in a young man who died of psoas abscess. There were eight small masses, of a pale yellowish color, and of a soft, curdy consistence, scattered through different parts of the gland, which was at the same time considerably reduced in size. The deposition of tubercular matter here is commonly associated with pulmonary phthisis; it seldom occurs under the age of forty-five or fifty, and appears to have a decided predilection, so to speak, for the follicular structure of the gland.

9. *Cancer* of the prostate gland is of singularly rare occurrence. Of scirrhus I have myself never seen a well-marked example. A few cases of encephaloid have been witnessed in this gland, mostly in old subjects. In a child, aged three years, whose history was kindly communicated to me by Professor Bush, of Lexington, Kentucky, the prostate was enlarged to the size of a hen's-egg, and was completely transformed into medullary matter. Colloid has never been witnessed in this body, and of melanosis I know of but one example, and that occurred in my own practice in 1855, in a man fifty-eight years of age, who had the same disease in other organs.

10. *Serous cysts* occasionally exist in the prostate, occupied by a thin, watery, mucous or glairy fluid, of a spherical shape, and from the size of a millet-seed to that of a pea or a hazel-nut.

11. *Earthy concretions* of the prostate are not uncommon (Fig. 282). Their composition is invariably phosphate of lime, with a little animal matter. In their size, they vary between a mustard-seed and a hazel-nut; they are of a rounded figure; their surface is smooth and polished; and their color is of a yellowish-brown. These bodies often exist in considerable numbers, being either imbedded in the substance of the gland, or situated in dilated ducts. In one case I found them of a regularly pyramidal figure. Their existence may often be detected by the sound, or by the finger introduced into the rectum.

Fig. 282.



Calculi of the prostate.

12. The excretory ducts of the prostate are liable to *dilatation*, forming small pouches, which may arrest the beak of the catheter, or become depôts for calculi. The sacs, the number of which is variable, are generally quite small, not exceeding the size of a cherry, but they may be as large as a marble; and cases occur in which the whole of one lobe, or even the entire organ, is converted into a thin, fibrous capsule, the proper substance of the gland being almost wasted. This lesion most commonly occurs in old persons, in connection with urinary calculi and chronic enlargement of the prostate.

13. Finally, the vessels of the prostate are liable to the formation of *phlebolites*. They are met with chiefly in old subjects who have long suffered under disease of the bladder and the associated organs. Their

number is usually small, their shape globular, their surface smooth, their color a pale grayish, their structure laminated, and their composition carbonate and phosphate of lime, with a small quantity of animal matter.

# CHAPTER XXVI.

## MALE ORGANS OF GENERATION.

I. *The Testicle.*—Weight and Volume.—Diseases of its Vaginal Tunic.—Inflammation.—Hydrocele.—Hæmatocele.—Earthy Concretions.—Orchitis.—Malignant Affections of the Testicle.—Tubercles and Hydatids.—Hypertrophy and Atrophy.—II. *The Spermatic Cord.*—Encysted Dropsy.—Varicocele.—Neuralgia.—III. *The Seminal Vesicles.*—Their Lesions, few in number and still involved in obscurity.—Tubercles.—Earthy Concretions.—IV. *The Scrotum.*—Carcinoma.—Excessive Enlargement.—Is sometimes affected with a peculiar Sloughing Ulcer.—Contains Foreign Substances, such as Teeth, Hair, and pieces of Bone.—Earthy Concretions. —V. *The Penis.* — Gonorrhœa. — Gleet.—Chordee.—Organic Stricture.—Abscess along the Course of the Urethra.—Malformations of this Tube.—Imperforation.—Morbid Erection of the Penis.—Degeneration of the Pectiniform Septum and Fibrous Sheath.—Carcinoma.—Syphilitic Ulceration.—Herpetic Affections.—Warty Excrescences.—Phymosis and Paraphymosis.—Sometimes Seat of Calculous Concretions.

## SECTION I.

### TESTICLE.

THE testicle, in the adult, is generally, according to my measurements, about twenty-two lines in length, by eighteen in breadth, and seven in thickness. Its medium weight I have found, in a considerable number of subjects, to be about five drachms, the minimum being three and a half, and the maximum six and a half. The weight of the epididymis generally ranges from two to three scruples.

The diseases of the testicle are numerous and important, and may be conveniently considered with reference, first, to its serous investment, and, secondly, with reference to its proper parenchymatous texture.

I. *Vaginal Tunic.*—The principal lesions of the serous membrane are inflammation, suppuration, hydrocele, induration, hæmatocele, fungous growths, and various transformations.

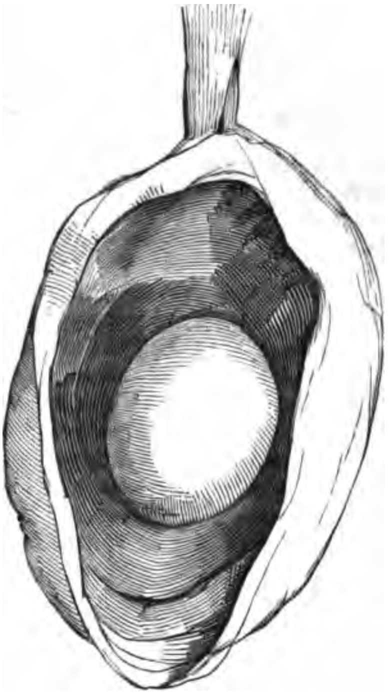
1. Acute *inflammation* of the vaginal tunic exhibits the same phenomena as the serous textures in other situations. There is more or less redness, with effusion of serum, fibrin, pus, or blood; and the contiguous surfaces of the membrane not unfrequently coalesce by the adhesive process. The serum is either absorbed or it remains until it is drawn off.

A secretion of pus is very rare, except as a consequence of hydrocele and its treatment. The matter is generally of a yellowish straw color, and, when allowed to stand, separates into two parts, one being thin and watery, the other thick and purulent.

Chronic inflammation of the vaginal tunic is of frequent occurrence in the inhabitants of warm climates, and in persons who suffer from disease of the urethra and prostate gland. It is characterized by opacity and thickening of the membrane, and by the effusion of different kinds of fluids, especially serum and lymph.

2. The vaginal tunic is naturally lubricated by a thin vapor, just sufficient for the easy movement of the testicle. In inflammation this vapor becomes condensed, and thus leads to the formation of what is named *hydrocele*. Fig. 283 represents the appearance of a tumor of this kind from a preparation in my private collection. The quantity of fluid seldom exceeds eight or ten ounces; but may amount to several quarts. Gibbon, the historian, had a hydrocele which contained a gallon and a half, and an instance is recorded where it amounted to forty pounds. From a table constructed by Dr. Dujat of 1,000 cases of this disease treated at the Native Hospital of Calcutta, it appears that the quantity of serum evacuated varied from less than ten to upwards of one hundred ounces. In 370 cases of double hydrocele the fluid was more abundant on the right side in 109, and on the left side in 128. Of the 630 cases of single hydrocele, the quantity of fluid in rather more than a third of the number, was under ten ounces; in two-sevenths it was from ten to nineteen ounces; in nearly a third from twenty to forty-nine; and in eighteen cases from fifty to one hundred and twenty ounces.

Fig. 283.



Hydrocele of the vaginal coat From a preparation in my collection.

The appearance of the water varies a good deal according to the duration of the disease. In young subjects, and in recent cases, it is generally clear and limpid; but under opposite circumstances it is of a pale straw, yellowish, amber, or citron color, or of the color of pale sherry-wine. More rarely the fluid is of a red or brownish tint, from the admixture of hæmatosin. In some instances it is of a lactescent appearance, and a case has been observed where it was perfectly green. In its consistence it commonly resembles water, but it may be thick, and almost as firm as jelly. When the disease is of long standing, and dependent on organic lesion of the testicle, the accumulated fluid is often purulent. In one case, I drew off nearly two quarts of pus and serum, of a very fetid character. White, flaky particles, soft, friable, and micaceous, or greasy, like adipocire, and composed of cholesterine, are likewise occasionally contained in the fluid of hydrocele. It has been suggested, with apparent probability, that these small particles are not the direct result of secretion, but the product of a chemical change in the effused liquid, similar to that by which adipocire is formed from flesh when subjected to protracted maceration in water. Spermatozoa are also sometimes found in this fluid.

The water of hydrocele is usually devoid of odor, but has a marked saline taste, and is coagulable by heat, alcohol, corrosive sublimate, and the dilute acids; circumstances which clearly show its close affinity with the serum of the blood, from which it is derived. From the analysis of Dr. Bostock, it appears that 100.00 parts of the fluid of hydrocele, of the specific gravity of 1024, consist of

| | |
|---|---|
| Water . . . . . | 91.25 |
| Albumen . . . . . | 6.85 |
| Uncoagulable matter . . | 1.1 |
| Salts . . . . . . | .8 |
| | 100.00 |

In recent hydrocele, the vaginal tunic is commonly unaltered; in old, on the contrary, it is apt to become hard, opaque, and thickened. Occasionally the inner surface has a rough, pitted aspect, from the effusion of lymph; and sometimes, though rarely, narrow bands extend from it to the testicle. The membrane may be partially ossified, or transformed into a hard gristly substance, which generally presents itself in the form of grayish, opaque patches, of various shapes and sizes. Loose bodies, of an oval figure, usually not larger than a pea, and of a fibrous, cartilaginous, or bony character, have been found in the sac; occasionally the fluid is contained in separate cells, or compartments, as in ovarian dropsy, and cases occur in which it is intermixed with serous cysts.

The albugineous coat is much less liable to suffer in hydrocele than the vaginal. It may, however, be variously affected, particularly in cases of long standing, or where the complaint is complicated with organic disease of the testicle. The most common changes are, increased thickness, induration, and the cartilaginous transformation. It has been found partially ossified, or studded with earthy concretions; it may also be the seat of fungous tumors, serous cysts, and warty excrescences.

The testicle may be perfectly healthy, or it may be changed in its size, form, and consistence. In recent cases, when the accumulation is very small, the alteration, if any, is proportionably slight; but when the quantity of water is unusually great, the pressure which it exerts upon the gland may be so severe as to lead to considerable flattening, softening, and more or less atrophy. In some instances, in fact, the tubular structure is nearly entirely absorbed.

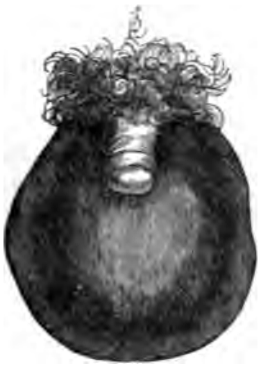
Hydrocele makes its appearance at all periods of life, in infancy, childhood, adolescence, and old age. Children sometimes labor under this complaint, from the vaginal tunic continuing to communicate with the cavity of the abdomen, and allowing the water effused there to descend along the groin. This constitutes what is called *congenital hydrocele.*

In 1000 cases of hydrocele treated at the Native Hospital of Calcutta, the age in

| | | |
|---|---|---|
| 41 | cases was from | 18 to 20 |
| 173 | " " | 21 to 25 |
| 473 | " " | 26 to 35 |
| 257 | " " | 36 to 45 |
| 43 | " " | 46 to 59 |
| 13 | " " | 60 to 70[1] |

Hydrocele is generally single, and the liability to the disease is nearly the same on both sides.

Fig. 284.



Hæmatocele of the scrotum.

3. *Hæmatocele* is a collection of blood in the vaginal sac, caused by mechanical violence, or inflammatory irritation; in the latter case it is ordinarily connected with hydrocele. The tumor is pyriform, dark, compressible, and filled with thick, grumous blood, often of the color of coffee-grounds. The vaginal tunic is sometimes preternaturally hardened, and its inner surface roughened with lymph. Sometimes the clots that are thus formed become organized, the vessels which they contain being susceptible of artificial injection.

4. *Encephaloid*, though occasionally found in the vaginal sac, is extremely rare. The morbid mass has a white, brain-like aspect, and possesses all the characters of fungus hæmatodes. It is commonly connected with hydrocele and thickening of the serous tunic.

5. Sometimes the vaginal tunic acquires a *cartilaginous* hardness; and portions of it have also been found in an ossified state. These transformations, which are occasional attendants on old hydroceles, ordinarily occur in small patches, of no determined shape; but sometimes they grow from the free surface of the membrane in the form of little spicules, the attachment of which is effected by very slender footstalks.

6. In dissecting persons that have long labored under hydrocele, or other chronic affections of the serous covering of the testicle, we occasionally find small *earthy concretions*, either in distinct sacs, or floating about in the serum. Their number, though sometimes considerable, seldom exceeds two or three; their size varies from that of a shot to that of a pea; and they frequently have a peculiar pearly lustre. Sometimes such bodies are partly osseous and partly cartilaginous; and now and then they are remarkably hard and gritty, like grains of sand. Their composition is carbonate and phosphate of lime, with about thirty-eight parts of animal matter in the hundred.

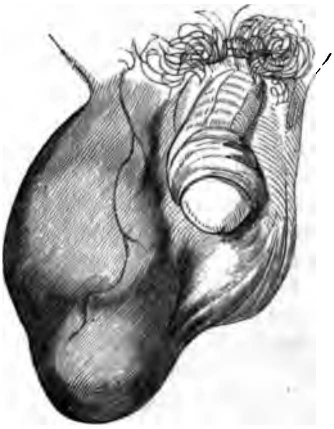
---

[1] Gazette Médicale de Paris, t. xvi. 1838, p. 561.

II. *Testicle.*—The testicle is liable to inflammation, abscess, scirrhus, encephaloid, tubercles, hydatids, and osseous degeneration.

1. The anatomical characters of *acute orchitis* are increased vascularity and thickening of the tubular structure, followed, when the disease runs high, by deep redness and softening. The organ swells, becoming hard and rounded, and the vaginal sac is either distended with watery fluid, or lymph is poured out, by which the two contiguous surfaces of the membrane are permanently glued together. The epididymis is usually involved in the affection, and in many cases the irritation extends along the spermatic cord, rendering it tumid and painful. Although it generally terminates by resolution, it sometimes proceeds to suppuration, or it leaves the organ in a state of chronic enlargement, or, finally, it may give rise to hydrocele.

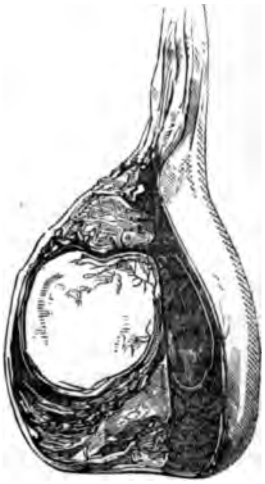
Fig. 285.



Acute orchitis.

2. When *suppuration* is about to set in, all the symptoms become suddenly aggravated; rigors come on often, attended with slight delirium; and the part is so painful that the patient can scarcely tolerate the weight of the bedclothes. The pus, being generally mixed with seminal fluid, is seldom of a healthy character; and, as it is confined by the albugineous coat, it is always a long while in reaching the surface. The abscess often breaks at several places, thus leaving unhealthy sores, which it is difficult to heal, and which not uncommonly lead to a total disorganization of the tubular structure. Suppuration of the testicle is most common in scrofulous subjects. The matter is sometimes encysted, as in Fig. 286.

Fig. 286.



Abscess of the testicle.

3. *Chronic inflammation* of the testicle is of rather frequent occurrence, especially in warm latitudes. It usually begins in hardness and swelling of the epididymis, whence it gradually extends to the body of the gland, the seminiferous ducts of which are dilated, indurated, and of a dark grayish color. At first, the organ, enlarged perhaps many times beyond its ordinary bulk, retains its natural smoothness, but by and by it becomes knobby and irregular. This form of the disease is often accompanied by effusion of serum into the vaginal sac, by the deposition of purulent matter in the parenchymatous structure, and by enlargement and thickening of the spermatic cord. In obsti-

nate cases, the gland is sometimes of a hard, compact consistence, grates under the knife, and is of a dark reddish color, not unlike half-boiled flesh. Cells are often found in its interior, containing different kinds of fluids. The disease occasionally affects both testicles.

4. *Genuine scirrhus* of the testis, such as is so often met with in the mammary gland, is an exceedingly rare disease. It is most common after the age of fifty. The affected gland is hard and knobby, of a whitish or grayish color, and intersected by dense fibrous bands, which pervade it in different directions, and add very much to its firmness. It is seldom that the morbid mass is of the same uniform consistence throughout, but it is usually more compact in some places than in others. Cartilaginous and osseous deposits are occasionally observed in it, and instances occur in which it contains small cysts, filled with various kinds of substances, fluid, semi-liquid, or solid. The vaginal and albugineous tunics are more or less thickened, and the tubular texture is entirely destroyed. As the disease progresses the epididymis, and frequently, also, the lower portion of the spermatic cord experience the same changes, becoming hard, knotty, and painful. When ulceration sets in the adjoining glands become swollen, from extension of the morbid action. The disease may exist alone, or be associated with scirrhus, tubercle, or encephaloid in other parts of the body.

5. *Encephaloid* is the most common malignant disease to which the testicle is liable. Commencing in swelling and induration of the body of the gland, its progress, although sometimes slow, is generally so rapid that the tumor quickly attains a very considerable bulk, involving the epididymis, and assuming a pyriform figure, with the base below and the apex above. In its first stages it consists of a soft, grayish, pulpy mass, looking very much like the cerebral tissue. It frequently contains serous cysts, coagulated blood, chocolate-colored matter, or a dark creamy substance, more or less offensive to the smell. One portion of the tumour may be so firm as to creak under the knife, and to exhibit the appearance of fibro-cartilage, or hard cheese; another is perhaps quite soft and pulpy, and a third may be of the color and consistence of a clot of blood, or a piece of decomposed flesh. In fact, there is no end to the diversified character of a tumor of this description. The tubular structure is generally entirely destroyed; the albugineous coat is very much thickened and indurated, or broken up and confounded with the diseased mass; and a considerable quantity of watery fluid, usually mixed with blood, is almost always found in the vaginal sac.

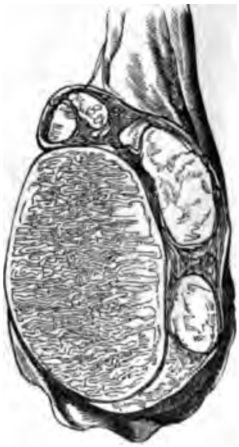
The tumor varies in volume from that of a fist to that of a fœtal head. When very bulky, there is always a corresponding enlargement of the vessels of the cord. The spermatic artery has been seen as big as the radial artery at the wrist. No period of life is exempt from this disease. It has been observed in children under twelve months of age, and in persons after eighty. The affection seldom occurs on both sides. When the morbid mass is removed, the disease generally reappears either at the cicatrice, or in the lymphatic ganglions of the groin, pelvis, or lumbar region.

6. *Colloid* scarcely ever attacks the testicle. A section of the morbid mass exhibits an immense number of small cells, cysts, or lodges, composed of fibrous walls, and occupied by different substances, as jelly, serosity, blood, and even pus. The proper structure of the testis is sometimes intact.

7. Of *melanosis* of the testicle our knowledge is exceedingly limited. I have myself not met with any examples of the kind, and very few have been reported by authors. Cruveilhier[1] has related the case of a man who died at the age of forty-six of melanosis of the lungs, heart, stomach, and other parts. The right testicle contained a small quantity of the same matter, and the left a deposit the size of a nut.

8. *Tubercles* are sometimes seen in the testicle, either in its parenchyma, on its surface, or in the epididymis: they are of a pale yellowish color, spherical, and about the size of a pea. Occasionally the scrofulous matter is infiltrated into the tubular structure; thus converting the gland into a curdy, friable, cheese-like body. The disease commences without local uneasiness, and is liable to cause ulceration, leaving thus a very unpleasant sore, which is of a pink color, fungous, irregular on the surface, and often highly sensitive. The deposit, which seldom takes place in both glands at the same time, generally begins at the epididymis, and thence extends to the body of the organ, the structure of which it sometimes entirely subverts. The matter is usually poured into the cellular tissue; but, in some cases, it is deposited directly into the excretory tubes. (Fig. 287.)

Fig. 287.



Tubercles of the testicle.

9. *Cystic disease* of the testicle is occasionally met with, chiefly about the middle period of life. The cysts of which it is composed vary in size from that of a mustard-seed to the dimensions of a small grape, a marble, or a pigeon's egg; they are extremely delicate, highly vascular, gregarious, and filled with a thin, transparent, straw-colored fluid, analogous to the serum of the blood. They are developed in the substance of the testicle, which is ultimately entirely destroyed, and they often exist in immense numbers, though in some cases there are not more than two, three, four, or, perhaps, half a dozen. Occasionally the coats of these cysts are very much indurated, if not partially transformed into cartilage or bone, and their contents are thick and glairy, like the white of egg, jelly, or inspissated mucus. In old cases large quantities of fibrin are sometimes effused, and the morbid mass is intersected by fibrous bands, which strikingly contrast with the other structures. Fig. 288, from Curling, is a section of a cystic tumor of the testicle, showing a multitude of cells of various shapes and sizes, with solid matter inter-

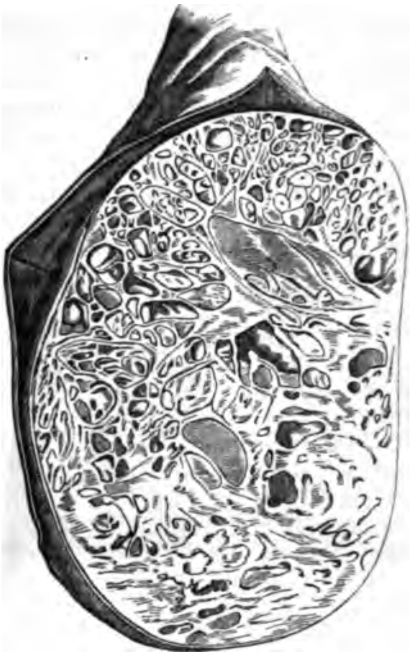
---

[1] Anatomie Pathologique, livr. xix., pl. 3 and 4.

posed between them. The natural structure of the gland has entirely disappeared.

The tumor is tardy in its progress, does not affect the general health, may attain the size of a common fist, and does not return after ablation.

Fig. 288.

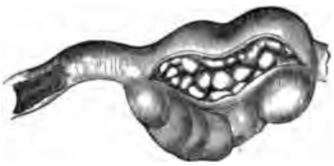


Cystic testicle.

10. Baillie[1] met with a *filaria medinensis*, or guinea-worm, in a small, firm cyst, adherent to the testicle. Paullini[2] saw a man whose left testicle contained an abscess, from which not less than fifty-seven small worms escaped. Morgagni found a small mass of fat between the epididymis and this organ, which was in other respects sound. The testicle has occasionally been the seat of acephalocysts.

11. Masses of *fibro-cartilage* are occasionally, though rarely, found in the testicle, either alone, or, as is more commonly the case, in union with other morbid products. They may be situated between the vaginal and albugineous coats, or in the tubular substance of the organ, which, when they are large or numerous, may be in great measure destroyed by them. They are usually small in size, and of an irregularly oval shape, with a rough, uneven surface, elastic, homogeneous, and of the consistence of fibro-cartilage. Sometimes they are partially ossified. When seated in the albugineous coat, or between this membrane and the vaginal, the new matter generally presents itself in the form of little patches, frequently not more than a few lines in diameter, and of a dull grayish color.

Fig. 289.



Calcareous matter in the testicle. From a preparation in my collection.

12. *Ossification* of the glandular structure of this organ is of very infrequent occurrence. Examples, nevertheless, are recorded by a considerable number of writers. The deposit may take place in any part of the testis, but is most common towards its centre, and is generally accompanied with considerable enlargement. It is often of an earthy

---

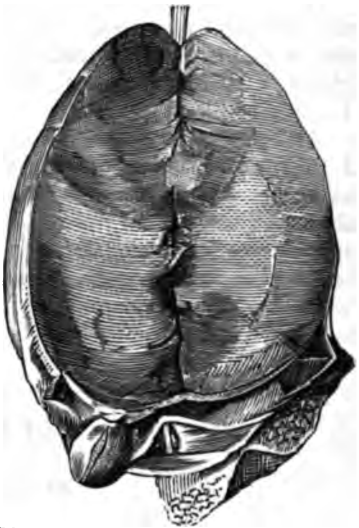
[1] Works by Wardrop, vol. ii. p. 313. London, 1825.
[2] Miscel. Natur. Cur. Dec. ii. An. iv., append., ob. 39.

rather than a bony nature, being nearly destitute of animal matter, and closely resembling the earthy substance found in the lungs and bronchial glands, as in Fig. 289.

13. The testicle may be transformed into a *fibrous* substance, not unlike that of a fibrous tumor of the uterus. The change probably begins in the internal cellular structure, which is gradually converted into white, grayish, or bluish filaments, narrow, dense, resisting, and interlaced in every conceivable manner. The new tissue interferes so much with the nutritive condition of the seminiferous tubes as to occasion, at first, a diminution in their size, and ultimately their entire destruction. When the transformation is complete the morbid structure is firm, solid, almost incompressible, and inelastic; it creaks under the knife, possesses very little moisture, and is nearly destitute of cellular substance. Small cysts, containing serous fluid, are occasionally interspersed through it, and specimens are observed in which there are tolerably large cavities filled with whitish, jelly-like matter. The tumor may be of the natural size of the testicle, or it may even be less, but in most instances it is as large as an orange or a fist. The vaginal and albugineous tunics generally preserve their natural characters. The disease has no tendency to return after removal.

Tumors of the kind just described occasionally grow within the vaginal tunic, the testis retaining its integrity. Some years ago I operated upon a colored man, twenty-five years of age, removing from the left side a fibrous mass weighing nearly five pounds. It was of an ovoidal form, larger below than above, and was eight inches and a quarter in length by thirteen in circumference at its widest part. Its surface was perfectly smooth, and adherent, in the greater portion of its extent, to the vaginal tunic by loose cellular substance. The testicle was situated at the lower extremity of the tumor, and, with the exception of being slightly flattened, had undergone no appreciable alteration. The vas deferens, also perfectly sound, ran along the posterior surface of the tumor.

Fig. 290.



Fibrous tumor of the vaginal tunic. From a preparation in my collection.

A section of the tumor exhibited a smooth, uniform surface, of a pale-grayish color. It was slightly elastic, almost incompressible, remarkably solid, and offered great resistance to the knife. A thin slice of it was opaque, and as tough as sole-leather. No cellular tissue could be detected among its component fibres, but here and there I could distinctly discern the orifice of a divided vessel. The tumor had been growing upwards of five years—during the last eighteen months very rapidly—and caused no other inconvenience than what resulted from its weight and bulk. The spermatic cord, the skin of the scrotum, and the glands of the groin were perfectly healthy. The patient recovered from the operation, but died some months afterwards of pulmonary phthisis. Fig. 290 exhibits the form and structure of the tumor; the testicle is seen at the base, to the left of the median line.

14. *Hypertrophy* of the testicle, without any appreciable change of structure, is very uncommon. The gland may attain the magnitude of a large fist. The general health is usually good; but the penis is sometimes incapable of erection, and the tumor incommodes by its weight. More commonly the hypertrophy is connected with induration, and various other deviations from the normal state.

15. *Atrophy* of this organ seems to arise from chronic irritation, leading to absorption of the tubular structure. It may result, however, from a great variety of causes, such as an abuse of venery, indulgence in masturbation, mechanical injury, obliteration of the spermatic arteries, and immoderate and long-continued use of iodine, opium, and other narcotics. In some instances it has been known to supervene upon injury or organic disease of the cerebellum; and, in the French soldiers, in Bonaparte's first campaign in Egypt, it was often produced, as was supposed by Larrey, by the employment of a species of brandy, manufactured from the date and laurel-berry. The wasting was generally very gradual, commencing with a loss of sensibility of the organ, which became softened, and at length reduced to the size of a small bean. Contemporaneously with this structural lesion was an altered state of the voice, with cessation of the growth of the beard, and complete loss of sexual power.

Another cause of this lesion is the mechanical pressure exerted upon the testicle by varicose tumors of the spermatic veins. The absorption which is thus induced often proceeds with great rapidity, until the gland is reduced to a soft, pulpy mass, scarcely equal in volume to a Lima bean.

Atrophy of the testicles occasionally exists as a congenital defect. I am acquainted with two young men in whom these organs are scarcely as large as a hazel-nut. One of them has never experienced the slightest sexual desire; the other has been married upwards of twenty years, but no offspring has followed the connection. Complete inaction of these organs, such as is observed in monks, is often attended with atrophy and impotence.

## SECTION II.

### SPERMATIC CORD.

The spermatic cord, composed of the deferential duct, of bloodvessels, nerves, and absorbents, all invested by a thin, fibrous sheath, is liable to encysted hydrocele, varicocele, and neuralgia.

1. *Encysted hydrocele* may be seated in the free portion of the cord, or it may occupy the part which lies in the inguinal canal. In the former situation, the nature of the swelling may be readily distinguished by its globular figure, by its firmness, transparency, and diminutive size; in the latter, the diagnosis is often obscure, and the surgeon is liable to confound the disease with inguinal hernia. The fluid of a hydrocele of this kind is generally very thin and limpid, and the cyst consists of two layers, the external being formed by the spermatic fascia, the internal, which is almost always thickened, by the remains of the peritoneum. In the descent of the testicle, the cord, as is well known, is loosely invested by a prolongation of the serous membrane of the abdomen; this, after a time, contracts close adhesions around the cord, and in this way the communication between the peritoneum and the testicle is gradually destroyed. Occasionally, however, the union is incomplete, and, a space being thus left, a slight secretion goes on, eventuating in the development of an encysted hydrocele. The tumor is commonly small, rarely exceeding the volume of a pullet's egg.

2. *Varicocele* is an enlargement of the spermatic veins, as they extend from the testicle towards the groin. The vessels are convoluted, knotty, elongated, harder in some places than in others, and irregularly dilated, some of them being more than six times the ordinary volume. Their parietes are very thick, dense, and rigid at some points, and very brittle and attenuated at others. In cases of long standing, some of the vessels are completely obliterated by adhesive inflammation, or by the formation of fibrinous concretions in their interior. Phlebolites are also occasionally found in them. The connecting cellular tissue does not experience any particular alteration, but the veins of the testicle itself are often considerably enlarged, as are also those which ramify between the vaginal and albugineous coats.

The disease is most common between the ages of puberty and twenty-five, and is almost peculiar to the left side; owing, as Dr. Brinton, of this city, has satisfactorily demonstrated, to the absence of a valve at the mouth of the left spermatic vein, while such an arrangement exists on the right side. It is often met with in several members of the same family. Its progress is usually slow. One of the most unpleasant effects to which it gives rise is atrophy of the testicle and epididymis, produced by the pressure of the enlarged and distended veins.

3. *Neuralgia* sometimes occurs in the spermatic cord, extending to the epididymis and body of the testicle. The affection, seated probably in the nervous plexus around the spermatic vessels, is of the nature of tic douloureux, being characterized by unnatural sensibility of the affected parts, with excessive tenderness on pressure, and pain in the groins, sometimes darting into the back and thighs. The testicle is but little swelled; the cord is not perceptibly altered; and, if the parts composing it be removed and carefully inspected, no lesion whatever is to be observed in them, excepting, in some rare cases, a slight thickening of the nerves.

# SECTION III.

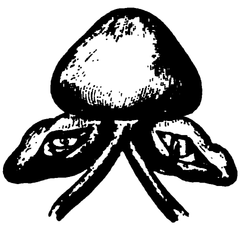
## SEMINAL VESICLES.

Little is known respecting the lesions of the seminal vesicles. That they are liable to derangement is sufficiently obvious; but that their diseases are few and of rare occurrence, is equally certain. They have hitherto been almost entirely overlooked in our examinations; and to this omission, perhaps, more than to anything else, is to be ascribed the meagreness of our information.

*Inflammation* of the seminal vesicles rarely exists as a primary disease; most generally it is propagated to them from the urethra, bladder, prostate gland, or testicles. In a few instances, pus has been detected in them; and, on one occasion, I found the left in a fetid, gangrenous condition. The individual was fifty-eight years of age, and died of inflammation of the prostate, accompanied with complete retention of urine for nearly a week. The right vesicle was of a dark color, from the loaded state of its vessels; and its cavity was filled with a thick, muco-purulent fluid, mixed with a small quantity of semen.

Collections of purulent matter in these reservoirs do not appear to be so uncommon as is generally supposed. The disease is usually, if not invariably, associated with, or, most probably, dependent upon, inflammation of the prostate gland, the testicle, or the urinary bladder. Occasionally all these organs are involved at the same time, and the inflammation may even affect the ureters and kidneys. The pus may discharge itself along the ejaculatory ducts, or it may make its way, by ulceration, into the urinary bladder or rectum.

Fig. 291.



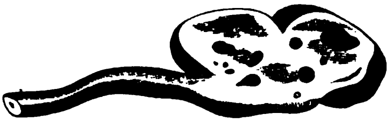
Tubercular matter in the seminal vesicles. From a preparation in my cabinet.

*Tubercular* matter is more rare in the seminal vesicles than in the testicles, uterus, or Fallopian tubes; I have witnessed only one example of it. The individual was twenty-seven years of age, for the last five of which he had labored under lumbar abscess, of which he finally died. Both reservoirs were remarkably pale, of a fibro-cartilaginous texture, and reduced to less than one-half their natural size. Their sacculated arrangement had disappeared, and their cavities were distended with yellowish tubercular matter, of a semi-concrete consistence. (Fig. 291.)

Small *earthy concretions*, of the same nature as those of the prostate, have been found in these reservoirs (Fig. 292). Their form is usually rounded, their surface smooth, and their color pale-grayish, white, or yellowish; their number varies from one to a dozen.

In a singular case mentioned by Mitchell,[1] more than two hundred were contained in the right seminal vesicle. The patient died of pulmonary phthisis, and the presence of the foreign bodies had not even been suspected during life.

Fig. 292.



Earthy concretions in a seminal vesicle. From a preparation in my collection.

The seminal vesicles have been observed to be very much indurated, and more or less changed in their structure. The most common transformations are the fibrous and fibro-cartilaginous. Occasionally their walls are of a dense, gristly nature, or partially ossified.

Finally, these reservoirs are sometimes remarkably small, and occasionally one of them is absent. In some instances their ducts are wanting, and in others they are obliterated by inflammation, lymph, or tubercular matter, of which I have seen several examples. A case has been published in which both the excretory tubes terminated in a sort of flexuous cul-de-sac, which supplied the place of the seminal vesicles.

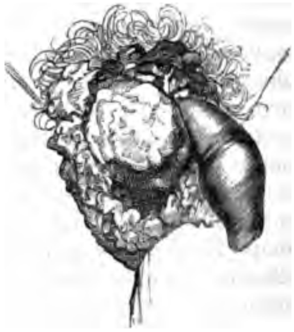
## SECTION IV.

### SCROTUM.

The scrotum is liable to inflammation, cancer, and other diseases. Of these it is only necessary to notice a few of the more important.

1. *Carcinoma* of the scrotum is generally of the epithelial kind, and seldom occurs before the period of puberty. It is most common in chimney-sweepers; and hence it has by some been named the chimney-sweeper's cancer (Fig. 293). The affection generally begins at the base of the scrotum, in the form of a small, wart-like excrescence, covered by a thin, scaly crust. After this has continued for a time, the hardened cuticle sloughs off, leaving a superficial, painful, ill-looking ulcer, with indurated and everted edges. The surface of the sore has a red, excoriated aspect, and discharges a thin, sanguinolent fluid, often highly irritating and offensive. In this way the ulcerative process gradually extends, until at length a large surface of the scrotum, together with the vaginal tunic and the exterior of the testicle, is involved

Fig. 293.



An aggravated example of chimney-sweeper's cancer; much superficial texture destroyed.

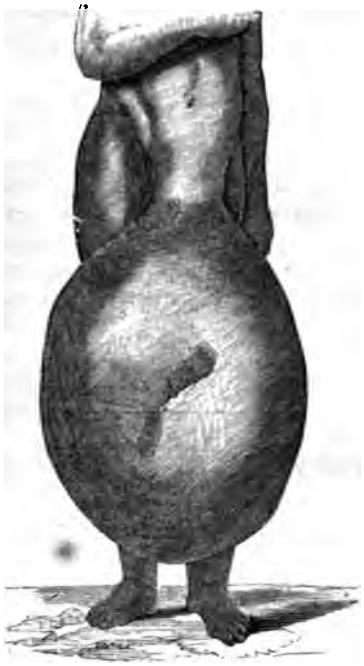
---

[1] Civiale, Traité sur les Maladies des Organes Genito-Urinaires, t. ii. p. 135.

in the disease. In this advanced stage, the cellular tissue around the sore is generally white and scirrhus; and the inguinal glands on one or both sides are enlarged, injected, and, in some instances, filled with cancerous matter.

2. The scrotum is sometimes transformed into a hard, fleshy mass, constituting what is termed *sarcomatous* enlargement (Fig. 294). The enormous magnitude which this disease may attain is almost incredible. A surgeon of the West Indies removed a tumor of this kind from the scrotum of a negro, which weighed seventy pounds; and Baron Larrey has detailed the particulars of another, which was supposed to weigh one hundred and twenty pounds. In the medical museum at Montpelier, is a diseased mass of this character, which was amputated by Delpech, the weight of which is one hundred and sixty pounds. In my private collection is a specimen of this disease, presented to me by Dr. Bozeman, of Alabama, which weighs forty pounds. It began in early life, and grew until the patient, a colored man, was twenty years old, when it was excised by that distinguished young surgeon.

Fig. 294.



Hypertrophy, or elephantiasis of the scrotum.

This disease is seldom observed in this country or in Europe; but in some parts of Asia and Africa it is not of infrequent occurrence, especially in persons afflicted with elephantiasis. Externally, the morbid growth is rough and fissured, and its surface, particularly in old cases, is covered with yellowish, scaly crusts, the detachment of which leaves so many small, herpetic sores, emitting a thin, ichorous discharge. The skin is very thick and indurated; the cellular tissue is firm and scirrhous, from the distension of its cavities with semi-concrete, albuminous matter; and the bloodvessels of the part, instead of being large and varicose, as we find them in most other tumors, are remarkably small and contracted. The swelling is indolent, and incommodes rather by its weight and bulk than by its pain. In its shape it is mostly pyriform, but sometimes ovoidal, or globular. The testicle is not necessarily implicated in this disease, nor is the spermatic cord so much indurated and enlarged as in some of the other disorders of the genital apparatus.

3. A peculiar *sloughing* disease occasionally occurs in the scrotum of young children. In a case which I saw many years ago in an infant two weeks old, a slough, about an inch in diameter, suddenly

formed over the right testicle, leaving the vaginal tunic perfectly denuded, and producing an angry-looking sore with hard glossy edges, reposing upon black-colored cellular tissue. The spermatic cord was indurated, tumid, and remarkably tender on pressure. The constitution did not seem to suffer much. In the course of twenty-four hours after these symptoms were discovered, the vaginal sac became distended; and, on puncturing it, a considerable quantity of sero-purulent fluid, of a yellowish color, followed the lancet. A small portion of the membrane now sloughed, leaving the gland quite bare; by touching the part with lunar caustic, and applying the yeast poultice, granulations gradually sprouted up, and the infant got well.

4. We sometimes find *cysts* in the scrotum filled with fatty matter, teeth, hair, or osseous fragments, or all these substances in a state of combination. In a case of this description, observed by St. Donat, a French surgeon, the tumor contained, among other pieces, two distinct frontal bones, the orbits of which were regularly hollowed out for the reception of two small, rudimentary eyes. In another example, the particulars of which have been published by Dr. Dietrich, Professor of Midwifery in the University of Glogau, the débris which was found in the testicle was composed of a pelvis and a lower extremity. A still more extraordinary instance was observed by Dr. Ekl.[1] In this case, the scrotal tumor was formed by the ribs, the spinal column, the orbits, and the thigh bones of a fœtus. A case has been reported by Dr. André, of Pétronne, in which he discovered hair and teeth in the testicle of a boy seven years of age.

But the most remarkable formation of this description is that mentioned by Velpeau,[2] and which this distinguished surgeon removed, in 1840, from a patient, twenty-one years old, in the Charity Hospital of Paris. The tumor, which had existed from birth, was of a rounded shape, of the size of a large turkey's egg, of a white color, insensible, and situated on the outer part of the right side of the scrotum; the corresponding testicle, epididymis, and cord being perfectly sound. At its posterior surface were three small openings through which fatty matter was occasionally discharged. A careful dissection showed the tumor to consist of two portions, one of which was solid, of a rosy tint, and made up of numerous pieces of bone, while the other, of a softer consistence, presented several cysts of different sizes and of variable contents. The largest cavity was occupied by a grayish fatty substance, composed of distinct portions connected by jelly-like matter; the one next in size contained a similar substance, only of a darker hue, and having in its centre a quantity of very fine hair; the remainder were filled with a yellowish, stringy fluid, not unlike the vitreous humor of the eye. The solid part of the tumor was composed of different bones, variously arranged, articulated with each other, and surrounded by masses of fat; the whole being evidently the remains of a fœtal skeleton.

---

[1] See the interesting treatise of Dr. Ollivier, of Angers, entitled "Mémoire sur la monstrosité par Inclusion," in which this and other cases are detailed.

[2] New York Journ. Med. and Surg., July, 1840, p. 202.

The above, and all similar formations, which, on the whole, are extremely rare, bear the closest analogy to those of the ovary, and they can only be accounted for on the theory of monstrosity by inclusion.

5. *Earthy deposits* of the scrotum are rare. They may take place in the form either of sand-like granules, or in that of calculous masses, from the volume of a pea up to that of an almond. Their number, although generally small, sometimes amounts to several dozens; they are of a dull whitish color, and of a cretaceous consistence, or even of the density and solidity of bone. Their chemical composition has not been ascertained; but, judging from what we know of these bodies in other situations, it is not improbable that they consist mainly of phosphate and carbonate of lime, cemented together by a small quantity of animal matter.

Hitherto these concretions have been found exclusively in subjects past the middle period of life, in association with hypertrophy. Their formation is generally very tardy, and the irritation which they produce sometimes leads to ulceration. In the interesting case observed by Professor Mott, the scrotum was nearly fifteen times the normal bulk, the patient was very far advanced in life, and the disease, which was removed by a surgical operation, had existed for upwards of twenty years.

6. Finally, the scrotum sometimes contains cysts communicating with the urethra, and filled with *calculous concretions.* The composition of the concretions is variable, but in general they consist of uric acid; they are usually quite smooth, ovoidal or spherical in their shape, and from the size of a millet-seed up to that of a Lima bean. Their number is sometimes remarkable, nearly as many as one hundred having been found in a single cyst. The cyst itself is commonly very thick, dense, and rough, especially in old cases.

## SECTION V.

### PENIS.

The penis consists of several parts, differing from each other in their structure and functions, and liable therefore to dissimilar lesions. The cavernous bodies are rarely affected, whereas the urethra and the spongy texture around it are very liable to disease. Of the lesions of these different component elements, I shall notice only the more important, commencing with those of the excretory duct.

1. *Acute inflammation* of the urethra, generally the result of impure connection, is marked by the same anatomical characters as acute inflammation of the mucous textures generally: that is, there is more or less redness, with opacity, and thickening of the lining membrane. In three or four days after the infection—sometimes not under a week—there is an increased discharge of mucus, followed in a short time by purulent matter, of a thick ropy consistence, and of a pale straw color.

The quantity evacuated in the twenty-four hours varies from one to several drachms; and, in violent cases, it is not unfrequently extremely acrid, of a greenish cast, or tinged with blood. The morbid action is usually limited to the anterior extremity of the urethra, occupying the first two or three inches; but now and then it pervades the entire tube, from one end to the other. There is always a general turgescence of the virile organ, with redness and swelling of the external orifice, the edges of which are often tender and pouting. Morbid erections are common, and the stream of urine is small and narrow, from the diminished calibre of the tube, caused by the turgid state of the lining membrane and the infiltration of the surrounding structures, especially the submucous. When the inflammation is violent, it is apt to extend to the neck of the bladder, the testicle, and spongy body of the penis, giving rise to effusion of lymph and the formation of abscesses. In ordinary cases, however, there is seldom, if ever, any breach of continuity.

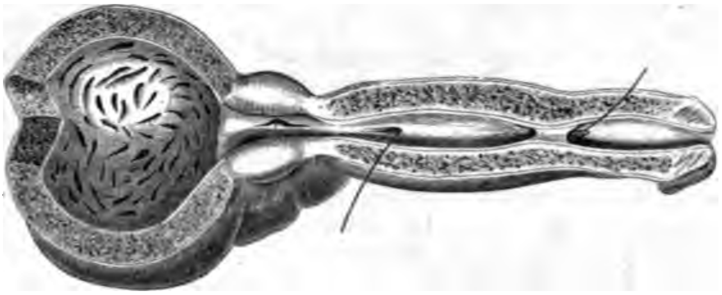
2. When the disease assumes the *chronic* form, the discharge becomes more thin and limpid, bearing a greater resemblance to the white of egg than to real purulent matter. The quantity, also, is much less than in acute urethritis, and there is seldom much pain, scalding, or itching during micturition. The passage, however, usually remains somewhat contracted, from relaxation of the mucous lining, and the urine, in consequence, is always discharged in a narrow, tortuous stream. When the disease, now called *gleet*, is protracted, it often gives rise to stricture, by which the canal is permanently obstructed.

A very frequent effect of gonorrhœa is the extension of the inflammation to the spongy structure of the penis, and the consequent effusion of lymph into its cells. This complaint, constituting what is called *chordee*, is characterized by abnormal erections, which are always most distressing during night, when the patient becomes warm in bed. The organ is curved downwards, from the spongy structure not admitting of so complete distension as the cavernous; and sometimes the cells are permanently obliterated, causing deformity of the penis, and imperfect erections. The effusion generally takes place about the middle of the organ, occupying occasionally a large extent of surface. In some cases, the deposition is effected at several points, though this is unusual.

3. Organic *stricture* of the urethra (Fig. 295) is the result of inflammatory action, causing an effusion of lymph into the submucous cellular tissue and the interstices of the lining membrane. After some time, varying from a few days to several weeks, the effused fluid becomes organized, and thus forms a permanent obstruction, in front of which the passage is generally contracted, whilst behind it is dilated. The urethra is sometimes narrowed by a circular ring, not thicker than a thread, but more commonly the stricture occupies a considerable extent of surface, from a line or two to an inch or more. Nor does it always surround the whole tube; in many cases, perhaps in most, it forms merely a segment of a circle. The bridle stricture, as it is called, consists of a dense band of organized lymph, stretched from one side of the urethra to the other. In old cases, the contracted

part, from repeated attacks of inflammation, is sometimes very elastic, firm, and almost of the consistence of fibro-cartilage. The most common seat of the disease is at the membranous portion, about seven inches from the external orifice; the one next in point of frequency is at the junction of the posterior with the anterior two-thirds of the tube; and lastly, at the part immediately behind the neck of the penis.

Fig. 295.



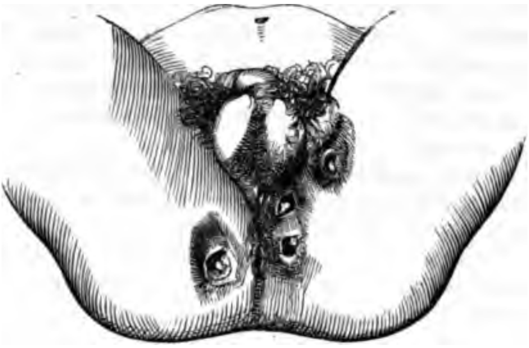
Stricture of the urethra, with false passage; enlargement of the prostate gland, and hypertrophy of the bladder. From a preparation in my collection.

Besides the lesion now described, there is a variety of stricture, to which the term *spasmodic* is applied, as it is supposed to depend upon spasmodic action of the urethra. Every practitioner sees cases of this kind, in his attempts to pass the bougie. The obstruction is most common in the membranous portion of the tube, but I have seen it affect it in nearly its entire extent, the instrument being grasped with so much firmness as to require considerable effort to withdraw it. An irritable state of the lining membrane, alone or combined with mental agitation, is the most common exciting cause of the stricture; the immediate one being the contraction of the muscular fibres which surround the urethra.

4. One of the most distressing consequences of stricture is *abscess*, followed by fistule in the perineum, the rectum, or along the course of the urethra. (Fig. 296.) The canal, as was before stated, is generally more or less dilated behind the constricted part, forming a pouch for the lodgement of the urine. Occasionally calculi are retained here, and give rise to disagreeable symptoms. The suppuration is often very slow in its progress, and as the matter accumulates in the submucous texture, the lining membrane of the canal yields at one or more points, followed by the escape of the contents of the bladder into the surrounding cellular substance, where they always produce considerable sloughing. Extensive infiltration is sometimes prevented by the cellular tissue immediately around the abscess being so much condensed by the deposition of fibrin, as to present an effectual barrier to the diffusion of the fluid. The fistulous openings thus formed gradually diminish in size, and become incrusted by a layer of lymph, which, in cases of long standing, sometimes degenerates into fibro-cartilage. The passage in front of the perforation being no longer needed for conveying urine, now contracts, and, unless means be used to dilate

it, is finally much diminished. The number of these apertures is often considerable, the perineum being literally riddled with them.

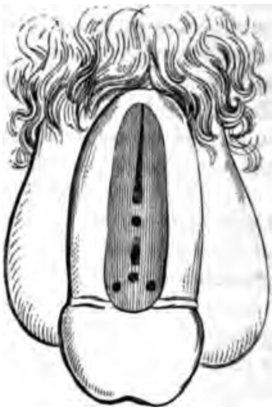
Fig. 296.



Urinary fistules in the perineum.

5. *Malformations* of the urethra may, for practical purposes, be arranged under the following heads: first, where the canal opens on the upper or lower surface of the penis; secondly, where it terminates in the perineum; and, thirdly, where it opens in front of the abdomen, just above the pubes. In *epispadias*, as the first of these malformations is styled, the preternatural orifice usually exists about an inch and a half behind the extremity of the penis; but it may affect the whole dorsal surface, as in the adjoining sketch. (Fig. 297.) In *hypospadias* it may be situated at any point between the gland and the scrotum, though its ordinary seat is opposite the neck of the organ, or just behind it. When the opening is in the perineum, the under surface of the penis is sometimes deeply grooved, the fissure extending down over the scrotum, and thus giving rise to an appearance of hermaphrodism, especially if, as occasionally happens, the testicles are retained in the abdomen, and the penis is very diminutive.

Fig. 297.



Epispadias.

When the opening is placed far back the subject of the malformation is generally impotent. To this rule, however, striking exceptions occur. Thus, I am acquainted with a colored man, who, although his urethra terminates at the scrotum, at least four inches from the ordinary point, is yet the father of five children.

The urethra may be congenitally imperforate, and occasionally, though rarely, it has a double meatus. Baillie mentions an instance in which there were two canals, the one pursuing the natural course, while the other, which was about two inches in length, terminated at one extremity in a cul-de-sac, and at the other opened at the head of the penis, in the usual situation.

When the tube is imperforate the obstruction may exist in any part of its extent, anteriorly, at the middle, or posteriorly, towards the neck of the bladder. The canal is sometimes entirely absent, at other times it is only partially deficient, and occasionally, again, the closure is produced by a sort of membrane, extending from one side to the other, in the form of a hymen. Cases have been observed in which the meatus was completely obstructed by the inflection of an elongated and adherent prepuce.

The effect of this congenital obstruction, or obliteration of the urethra, is great distension of the urinary bladder, with enlargement of the ureters, and a peculiar cystiform dilatation of the kidneys. These changes also show, what has not been admitted by all physiologists, that micturition is naturally performed before birth, and that the secretion of urine may be carried on even after the renal tissues are almost entirely destroyed.

6. *Morbid erection* of the penis may be produced by inflammation, followed by an effusion of lymph into the cells of the cavernous bodies. I have never inspected a case of this kind after death, but observed one several years ago in a young mechanic, which lasted for nearly four weeks, in spite of the most rigid antiphlogistic measures. It came on soon after intercourse, and was attended with excessive pain, together with much constitutional disturbance. For several months after the violence of the disease had abated, the organ remained small, flaccid, and incapable of complete erection. Sometimes the priapism is caused by an effusion of pure blood, in which case, if the fluid is not absorbed, the individual continues permanently impotent.

7. The pectiniform septum of the penis is liable to the *cartilaginous* transformation. I recollect a curious instance of this kind in a patient of the late Dr. George McClellan, of this city, for whose relief that gentleman was obliged to perform an operation. The man was between fifty and sixty years of age; the disease had been coming on gradually; and the organ was curved towards the perineum to such a degree as to interfere materially with sexual intercourse. The operation was entirely successful. Such a lesion, as the reader may readily conceive, might be a cause of impotence.

The fibrous sheath of the cavernous body is sometimes affected in the same manner as the pectiniform septum. The transformation, according to my observation, is most common in persons from thirty to forty years of age, and usually occurs in small patches, from the size of a three cent piece to that of a dime. Persons who indulge much in sexual intercourse are, I believe, most liable to it. When several such spots exist, they may interfere materially with the erection of the penis.

8. The penis is liable to *carcinoma*, chiefly of the epithelial form. The disease usually begins as a little wart, tubercle, or fissure, on the head of the penis, or the foreskin, from which it gradually spreads to the other structures, until the greater portion is destroyed. The resulting ulcer is at first quite small and superficial; by and by, however, it

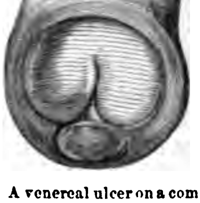
becomes broader and broader, and at last throws out a cauliflower-like fungus. There is now a profuse discharge of thin, sanious, and offensive matter, the inguinal glands rapidly enlarge, and the patient is harassed with severe lancinating pains darting up towards the abdomen, his constitution being at the same time completely undermined by the local disease. Cancer of the penis is most common in old men, and its occurrence is generally supposed to be favored by the existence of a long and tight prepuce. Of the truth of this opinion, however, my own experience has not furnished me with any examples.

9. *Syphilitic ulcers*, generally known by the name of *chancres*, although they may occur on any part of the body, invade the mucous texture always in preference to the cutaneous. Indeed, before the latter can be involved, it must be deprived of epidermis; for, so long as this preserves its integrity, it is impossible for the venereal virus to produce its specific effect. Their most usual seat is the inner surface of the prepuce, together with the neck of the penis, the orifice of the urethra, and the sides of the frænum. These ulcers vary extremely, both in size and number, being sometimes quite small, and at other times forming large sores. In the plurality of cases, there are not more than two or three; but occasionally there are as many as six or eight, appearing either simultaneously or in pretty rapid succession.

It is now well ascertained that all chancres of the mucous membrane of the genital organs, both in the male and female, are originally of a pustular form. The only exception to this law is where the virus is applied to an abraded surface, which modifies the appearance of the sore, converting it at once into a running ulcer. It is highly probable that the matter, in ordinary cases, is deposited, in the first instance, in the mucous follicles, where it excites a specific inflammation, eventuating in the secretion of a fluid, which is capable, in its turn, of creating a similar disease. What corroborates this opinion is the fact, just adverted to, that chancre always begins in the form of a pustule, and that it is most apt to be developed in those situations which abound in muciparous glands.

The initial step of the disease is a small, reddish, indurated speck, the summit of which is speedily converted into a spherical vesicle, filled with a thin, colorless serosity. Its size scarcely equals that of a mustard-seed; and its parietes, being formed by the mucous epithelium, are so excessively delicate as to break upon the slightest touch. Hence it is frequently ruptured before an opportunity is afforded of inspecting it, which is the reason, doubtless, why it so long escaped the notice of pathologists. On bursting, the vesicle leaves a small circular ulcer, with hard, jagged, and abrupt edges, as if they had been cut vertically. (Fig. 298.) The surface of the sore is gray, yellowish, or ash-colored, and the parts immediately around it are indurated, thickened, and of a deep, florid hue, being formed into a distinct, circumscribed tumor. The discharge is at first

Fig. 298.



A venereal ulcer on a common site. The characters are chiefly those of the Hunterian chancre. After Acton.

of a foul, sanious, irritating character; but by degrees it assumes all the properties of laudable pus. The induration commences about the fifth day, and forms one of the most constant characters of chancre. It is about this period that the system begins to be in danger of contamination from the absorption of the virus.

A chancre appearing on the cutaneous surface generally begins in the form of a pimple, which is surrounded by a red areola, and contains a thin serous fluid, which, on the fifth or sixth day, becomes purulent. The part about this period presents the aspect of a pustule, not unlike that of smallpox; the structures on which it rests being somewhat indurated and œdematous, from the effusion of coagulating lymph. In a few days more the matter becomes thick, the pustule shrinks, and a scab begins to form, which, on falling off, exposes a deep, rounded ulcer, encircled by a prominent, violet-colored ring. The scab, which is thick, and often of a truncated, conical shape, is soon succeeded by others; and thus the disease proceeds until the part either gets well, or yields to the devastating influence.

Syphilitic ulcers are very apt to spread, and even to terminate in gangrene. The slough is black, and at first small and circumscribed, but afterwards more or less extensive and ragged. The entire chancre is thus sometimes lifted from its place, leaving the surrounding tissues in an inflamed and infiltrated condition, with a sore that is easily healed. More generally, however, the ulcers assume a phagedenic character, and throw off fresh sloughs until, perhaps, the whole penis is involved in the mischief.

Many chancres, after having persisted for a variable time, gradually exhaust themselves, and finally cease spontaneously, the event being announced by the secretion of laudable pus, and the development of healthy granulations. In whatever manner the reparation is effected, whether by art or the efforts of nature, there almost always remains a hard, gristly tumor, which is more or less tender on pressure, very slow in disappearing, and extremely prone to new attacks of ulceration. Indeed, so common is this, that chancre may be considered as a genuine phœnix, which springs from its own ashes, and furnishes the food for its own nourishment. So long as the disease is confined to the penis, it is strictly a local affection; but it has a tendency, sooner or later, to work its way into the system; the first evidence of which is generally a swelling of one of the lymphatic ganglions of the groin, known by the name of bubo.

Chancre alone can produce chancre. Inoculation has fully established the fact that the matter of gonorrhœa can no more produce chancre than the matter of chancre can produce gonorrhœa. It has also been ascertained that it is during the ulcerative stage that the sore yields its specific secretion; after this stage has passed, it loses its character, its nature changes, and its poisonous property is destroyed. Dilution with other substances renders its operation not only uncertain, but at times completely inert. The part to which it is applied must likewise be free from acute inflammation, from pus, and from unctuous matter.

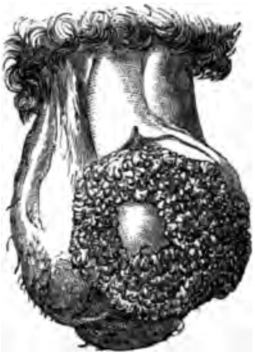
The period of latency is uncertain. Occasionally the disease follows inoculation in twenty hours; at other times—and this is most common—several days elapse; and, in some instances, it does not make its appearance under a few weeks. The nature of the part affected seems to exert considerable influence upon the production of chancre. Thus, the prepuce is more easily diseased than the gland, and the latter than the skin of the penis and scrotum.

10. *Herpetic* ulcers are chiefly observed in adults, on the inner surface of the prepuce, or at the junction of the skin and mucous membrane. They manifest themselves by inflamed spots, of a bright red color, varying in size from that of a millet-seed to that of a split pea. Small vesicles soon succeed, of a globular shape, remarkably transparent, agglomerated, and containing at first a serous, and subsequently a puriform fluid. On the internal surface, these vesicles lead to the development of thin, flat scales which fall off about the fifth day, leaving a corresponding number of round, yellowish excoriations; on the external surface, rough, irregular scabs form. This disease is very apt to recur, and is usually attended with some itching, rarely with real pain. Friction and want of cleanliness are the principal exciting causes. By running together, these ulcers occasionally form one unbroken sore, occupying nearly the whole of the prepuce.

11. The *psoriasic* ulcer is most frequently met with in persons who have the foreskin unnaturally long, moist, and tender. It is an obstinate and painful disease, characterized by deep cracks, or fissures, on the edges of the prepuce, which becomes gradually thickened, hardened, and so corrugated as to occasion phymosis. The number of ulcers is sometimes quite considerable; they are very tender and unseemly; apt to bleed when injured; extremely difficult to heal; and, if large, attended with a copious, puriform discharge. Small, brownish-looking scales occasionally form on these sores.

12. The penis is liable to the development of *warty excrescences* (Fig. 299), as a consequence chiefly of gonorrhœa and syphilis. Although they may occupy any portion of the organ, they are most common around the neck and at the side of the frænum, where they often occur in immense numbers, from the size of a pin-head up to that of a pea; they are usually of a conical shape, with a rather small pedicle, rough, fissured, or tuberculated, of a firm consistence, of a bright florid color, and of a fibrous structure. When these vegetations are very numerous they form a large tumor beneath the prepuce, which secretes an abundance of fetid pus. They frequently bleed on the slightest touch, and are always prone to recur after extirpation.

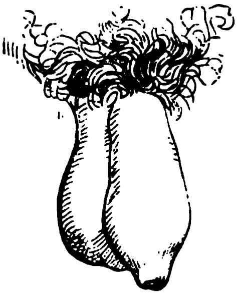
Fig. 299.



Warts on the penis.

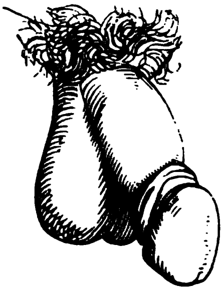
13. *Phymosis* (Fig. 300) consists in a contracted and elongated condition of the prepuce, attended with an inability to uncover the head of the penis. It presents itself in two varieties of form, the congenital and the acquired. In the first, the narrowing of the prepuce depends chiefly upon the tightness of the mucous mem-

Fig. 300.



Phymosis.

Fig. 301.



Paraphymosis.

brane, the other component parts retaining their natural character; in the other all the structures are condensed by inflammatory deposits, which in time often spontaneously disappear.

14. *Paraphymosis* (Fig. 301) is the reverse of phymosis, and is always an accidental occurrence, causing a stricture just behind the head of the penis, which, in severe and neglected cases, may not only produce great suffering, but mortification of the strangulated tissues.

15. When the prepuce is very long and narrow, it may become a receptacle for *calculous concretions*, of which some very curious examples are upon record. They are usually composed of uric acid, and vary in size from that of a mustard-seed to that of an almond. Cases have been witnessed in which there were as many as fifty, sixty, and even a hundred of these concretions. Their shape is spherical, or ovoidal, their surface rough or smooth, and their color grayish or pale ash. They are formed directly from the urine, which, in consequence of the difficulty of its escape through the narrow orifice of the prepuce, deposits its salts in the phymotic pouch.

# CHAPTER XXVII.

## FEMALE ORGANS OF GENERATION.

I. *The Uterus.*—Observations on its Weight and Volume.—Liable to Malformations —Retroversion.—Prolapse and Inversion.—Is apt to suffer from Inflammation, both of its Lining Membrane, its serous Covering, and its proper Tissue.—Remarks on Uterine Phlebitis.—Softening.—Induration.—Atrophy.—Fibrous Tumors.—Different Species of Polypes.—Calcareous Concretions.—Transformation of the Uterine Tissue into Cartilage and Bone.—Malignant Diseases.—Encephaloid and Scirrhus.—Tubercular Deposits.—Rupture.—Hemorrhage.—Accumulation of Air.—Hairs.—Obstructions of the Mouth of the Womb.—Hydatids.—Uterine Moles. II. *The Ovaries.*—Their Disorders are numerous and important.—Osseous Transformations.—Serous Cysts and Hydatids.—Scirrhus.—Occasionally contain Teeth, Hair, and Fragments of Bone.—Hemorrhage.—Remarks on the Corpora Lutea. III. *The Fallopian Tubes.*—Are seldom affected with Disease. IV. *The Vagina and Vulva.*—Liable to the same kinds of Maladies as other Mucous Structures.—Polypes of the Vagina.—Varices.—Enlargement of its Mucous Follicles.—Vices of Formation.—The Great Labia.—Polypes.—Clitoris.—Nymphæ, and Orifice of the Urethra. V. *The Mammary Gland.*—Is often the seat of Acute and Chronic Inflammation.—Its Diseases, in many respects, resemble those of the Testicle and Ovary. VI. *Placenta.*—Inflammation.—Suppuration.—Softening. — Cartilaginous Degeneration.—Ossification. — Fatty Degeneration. — Hypertrophy.—Tubercles.—Sanguineous Effusions.—Umbilical Cord.

## SECTION I.

### UTERUS.

THE sexual system of the female consists of the uterus, Fallopian tubes, ovaries, vagina, vulva, and mammary glands. Previously to the age of puberty, these organs are extremely small, and as they do not exert any particular influence on the constitution, they are not at all prone to disease. When they have attained their full development, however, their importance is deeply felt by the system at large, and they then become subject to a great variety of morbid alterations, both of a functional and organic character, which either impair the general health of the female, or terminate in destructive mischief.

The weight and dimensions of the uterus vary very much in different individuals, as well as at the different periods of life. In six specimens taken from young virgins, soon after the establishment of the menstrual function, I found the average weight to be one ounce and a half, the minimum one ounce, and the maximum one ounce and three quarters: the medium length was two inches seven lines; the breadth, from one Fallopian tube to the other, eighteen lines; and the thickness ten lines and a half. Of the neck, the length was fourteen lines, the breadth eleven, and the thickness eight. The lips, which varied in thickness from three to four lines, were perfectly smooth and rounded, and enclosed a circular orifice scarcely a quarter of an inch in diameter. In two of the specimens the aperture presented the appearance of a transverse slit. The horizontal diameter of the inferior extremity was eight, the antero-posterior, seven lines. The medium thickness of the parietes was five lines at the body, and four at the neck. The length of the fundus of the organ rarely exceeds the fourth of an inch.

The dimensions of the virgin uterus are stated by Madame Boivin and Professor Duges to be the following:—

| | | |
|---|---|---|
| Total length . . . . | 26 | lines. |
| Breadth of the fundus . . . | 17 | " |
| Thickness . . . . . | 8½ | " |
| Length of the cervix . . . | 13 | " |
| Breadth . . . . . | 9½ | " |
| Thickness . . . . . | 7 | " |

Of the walls of the body of the organ the thickness, above, was five lines and a half, laterally five lines, posteriorly four lines and a half, and anteriorly four lines. The entire weight, without the appendages, was five drachms. The woman, who was twenty-five years of age, had never been married; her stature was moderate, and the menstrual function had always been regular.

In married women who have borne children, the same writers estimate the weight of the uterus at from one ounce and a half to two ounces; the total length, at from two and a half to three inches. The length of the body is two inches; of the cervix, from thirteen to fifteen lines, the breadth of this portion being eighteen lines. The thickness of the body is fourteen lines, and sometimes much more; of the cervix, from eight to ten lines; of the contracted part, eight lines; of the parietes of the body, six lines. The breadth of the vaginal orifice is stated at six lines.

1. *Malformations.*—The uterus is liable to various malformations, of which the most common and important are, first, entire absence of the organ; secondly, deficient evolution; and, thirdly, increase of development.

1. Absence of the uterus is generally connected with absence of the ovaries and the Fallopian tubes. The vagina is also frequently wanting; and the external parts of generation are either completely deficient, or represented as it were in miniature. When the ovaries are present, the vulvo-vaginal structures are more perfect, the mammary glands are more expanded, and the females possess more of the characteristic attributes of their sex.

2. Cases also occur in which the womb is remarkably small, or in which it exists only in a rudimentary state. Julius Cloquet[1] has described the sexual organs of a woman, twenty-two years of age, in whom the uterus was not larger than that of a child of twelve months. The vagina was also very small; but the ovaries and Fallopian tubes

---

[1] Journ. Gén. de Méd., t. lxx. p. 274.

were well developed. Cases not unlike this are to be found in various periodicals.

3. There are other deviations from the normal standard which deserve brief notice here. These relate to the conformation of the uterus, and may be arranged under several heads. In the first place, the uterus may be double, as in Fig. 302. The organ is of an elongated, cylindrical figure, and is divided, by a longitudinal septum, into two parallel canals, precisely alike in size and shape, and opening either into a separate or a common vagina. In the second variety, the uterus is also double, but instead of being united along the middle line, the two parts are free, except at their inferior extremity, where they are connected by a sort of isthmus. This may be named the bipartite uterus. It is well represented in the annexed cut. (Fig. 303.) It bears some resemblance to the tubular oviduct of birds, and each organ opens into the vagina by a distinct orifice. Fig. 304 illustrates an unusual species of malformation, consisting of two uterine bodies, one much smaller than the other, and terminating by a common mouth. The organ bears some resemblance to the womb of some of the inferior animals, both herbivorous and carnivorous. Finally, there is a variety of malformation, in which the cavity of the uterus is divided into two parts, by a longitudinal septum, which, however, is generally imperfect. The organ is

Fig. 302.

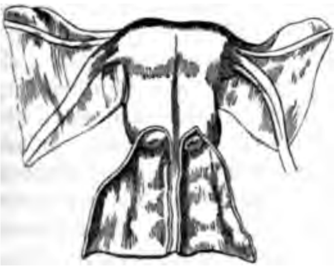


Fig. 303.

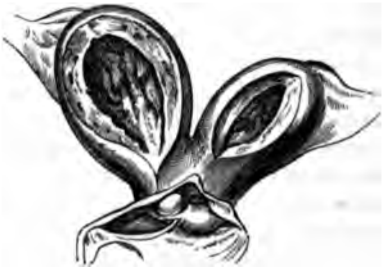


Fig. 304.

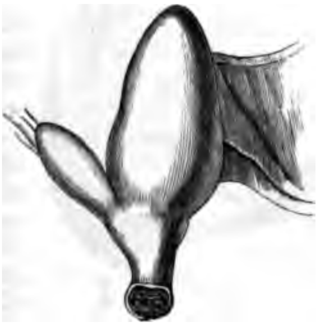
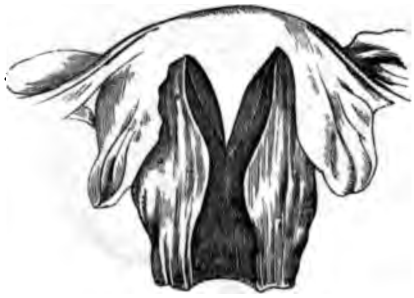


Fig. 305.



well formed externally, except that it is unusually large at the fundus. These appearances are well seen in Fig. 305.

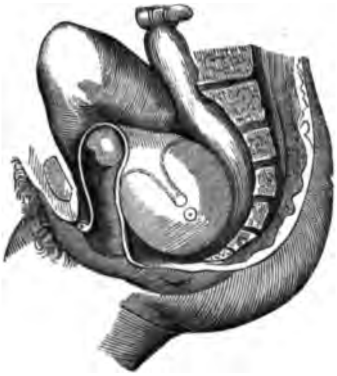
All these deviations from the normal formation are perfectly compatible with impregnation. In some cases they are associated with absence or deficient development of the ovaries and Fallopian tubes; but, generally speaking, these structures are present, as in the natural state. In no instance, so far at least as my knowledge extends, were there two ovaries and two Fallopian tubes on each side, not even in the bipartite variety, the nearest approach to two separate wombs.

In women who have borne children, the womb is always larger than in virgins, or than in those who are barren: its substance is also more dense and firm, its lips are more jagged and irregular, and sometimes, though rarely, the orifice of the organ is completely obliterated. Morgagni refers to a case where the closure was effected by an adventitious membrane; and similar examples have since been recorded by others. The occlusion may also be produced by inflammation, attended with an effusion of plastic lymph. The orifices of the Fallopian tubes are also sometimes closed, either congenitally or as the effect of disease. In a few rare instances the uterus and vagina have been known to constitute one solid mass, without any cavity or opening in either; and occasionally, again, though this is also very infrequent, the cavity of the former is divided, by a transverse septum, into two chambers, one corresponding with its base, the other with its neck. This lesion is most common in very old females, and is generally, if not invariably, the result of inflammatory irritation, leading to adhesion of the isthmus of the organ.

2. *Malpositions.*—Of the various malpositions to which the uterus is liable, the most common are retroversion, anteversion, prolapse, and inversion.

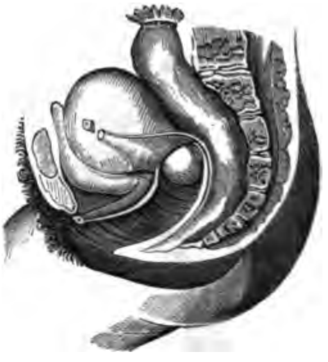
In *retroversion* (Fig. 306), the orifice of the uterus is tilted up against the pubic symphysis, and the fundus is thrown downwards and backwards, so as to form a tumor between the vagina and the rectum. Thus the axis of the organ is totally reversed relatively to its natural

Fig. 306.



Retroversion of the uterus.

Fig. 307.



Anteversion of the uterus.

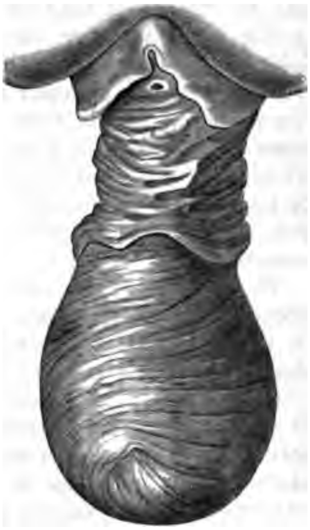
situation within the pelvis. This species of displacement is most apt to occur between the third and fourth months of pregnancy; it may, however, take place at a much later period; and, in some instances, it has been noticed soon after delivery. Its progress, though occasionally gradual, is generally rapid.

*Anteversion* (Fig. 307) is a displacement precisely the reverse of the preceding, that is, the fundus of the womb is carried forwards on the urinary bladder, and the mouth backwards towards the rectum and the hollow of the sacrum. It rarely occurs during pregnancy, and is almost always associated with hypertrophy of the uterus. The anteversion is sometimes produced by morbid adhesions between the organ and the peritoneum, which have the effect of forcing it out of its normal position.

The uterus is liable to *prolapse*. Notwithstanding that it has four ligaments which serve to maintain it in its natural position within the pelvis, it not unfrequently, both in its empty and gravid state, loses its hold, and falls down into the vagina, or even beyond the vulva. In the latter case, the organ forms a tumor between the thighs, with a small central aperture corresponding to the mouth of the womb, and the vagina is completely inverted, or pulled inside out. The accident is always attended with a thick muco-purulent discharge.

In *inversion* of the uterus, the viscus is turned inside out. (Fig. 308.) It is generally attended with more or less prolapse of the body of the organ, and seldom happens except during delivery of the after-birth, or the forcible removal of some tumor from its interior. Of this lesion there are three degrees. In the first, the fundus falls down nearly to the mouth of the womb, where it is arrested; in the second, it passes beyond this point for half or more of its length; in the third, the whole organ escapes at the inferior orifice. In the second case, it is obvious that the body and fundus may be compressed, or strangulated, by the contraction of the neck.

Fig. 308.



Inversion of the uterus. From a preparation in Professor Meigs's collection.

3. *Inflammation.*—The uterus is liable to inflammation, both in the married and in the single female, but much more frequently in the former than in the latter. The disease may attack any portion of the organ, or it may be limited to the lining membrane, the parenchymatous substance, or the peritoneal covering, or all these structures may be involved simultaneously, together with the venous and absorbent trunks.

Inflammation of the lining membrane is characterized by the same phenomena that are observed in inflammation of the mucous textures in other parts of the body. The redness, which is of a deep shade, is often spread over a large extent of surface, and in violent cases it is not uncommon to meet with small ecchymoses, followed by an escape of blood on pressure. The mucous follicles, especially those about the mouth of the uterus, are in a state of enlargement, and there is usually, in the course of a few days, a great increase of the natural secretion. In some instances, pus is deposited, and continues to be discharged for a considerable period, as in inflammation of the mucous membrane of the vagina.

Occasionally the inflammation of the lining membranes eventuates in an effusion of coagulating lymph. The occurrence is often seen in young females of a robust, irritable temperament, in whom it constitutes a frequent cause of dysmenorrhœa. The membranous concretion, which is seldom thick or firm, generally moulds itself to the inner surface of the uterus, and is sometimes expelled entire, though much more commonly in small pieces. The period required for the extrusion varies from a few hours to a number of days, and is always attended with much suffering. When the lymph extends into the Fallopian tubes, it may lead to sterility by occluding their uterine orifices.

Inflammation of the body and serous covering of the uterus is most common in females during the first eight or ten days after parturition. It sometimes betrays an epidemic tendency, and rapidly passes into suppuration, softening, or even gangrene. The pus that is poured out, in such cases, may be situated in the parenchymatous structure, in the uterine cavity, the subserous cellular substance, between the folds of the broad ligaments, or, finally, in the venous and absorbent trunks, or simultaneously in all these parts. In most of these localities it occurs in the form of small yellowish-looking globules; but cases are observed in which the fluid is collected into distinct abscesses, which are never very large, and which manifest a disposition, sooner or later, to burst into the vagina, the rectum, pelvis, or urinary bladder. The pus is generally blended with a good deal of lymph, and is sometimes highly offensive.

The lesion may originate in, and be limited to, the veins; but, in the great majority of cases, the parenchymatous structure participates in the inflammation, assuming a dark livid aspect, at the same time that it loses its natural consistence. Serum and pus may also be found in the subserous cellular tissue; and the peritoneal investment is sometimes covered with thick patches of lymph. The veins themselves are always much enlarged, and their cavities are filled with pus, clots of blood, or plugs of adventitious membrane. The disease often extends along the venous trunks of the pelvis to those of the abdomen, or even to those of the inferior extremities; and very frequently the absorbent vessels are similarly circumstanced, being greatly augmented in volume, and infiltrated with enormous quantities of purulent matter. The causes of uterine phlebitis are not always very evident. In some cases, it appears to result from violence done in the extraction of the placenta, while in others it may be traced to the effects of cold and moisture, irregularities of diet, or to some peculiar noxious condition of the atmosphere. The lesion is said to be more frequent on the right side than on the left, and to be sometimes entirely limited to the veins in that situation.

4. *Ulceration.*—Ulceration of the uterus may occur at any period of life after puberty, but is most common between the ages of thirty and forty, in married women. It usually attacks the lips and neck of the organ, and exhibits every variety of form, from the slightest abrasion, merely involving the mucous lining, to a cavity several lines in depth. In its shape it may be circular, oval, or linear. In many cases it has the appearance of a crack, chap, or fissure, lying longitudinally or obliquely upon the surface of the affected lip or neck. Its edges are sometimes very abrupt, giving the part the appearance as if a depression had been made into it with a punch. The bottom of the ulcer is smeared with unhealthy pus, incrusted with lymph, or studded with granulations, of varying size, color, and consistence. The surrounding structures are red, tender, and often quite indurated. In cases of long standing, or unusual severity, the lower extremity of the uterus is excessively engorged, considerably enlarged, and greatly altered in its figure, often exhibiting a knobbed, clubbed, or pouting appearance. In some cases, the affected structures, instead of being indurated, are abnormally soft, or hard at one point and soft at another. In the more aggravated forms of ulceration, the organ increases in its weight, and thus becomes a cause of its own prolapse, by its dragging effects upon its ligaments.

The discharge which accompanies the ulcerative action is subject to the greatest possible variety, both as it respects its quality and quantity. Thus it may be thick and yellow, thin and sanious, bland or irritating, scanty or abundant, free from odor or more or less fetid. In general, it is mixed with considerable mucus, of a thick, ropy character.

Ulcers of the uterus may be acute or chronic, simple or specific. The simple ulcer usually arises without any assignable cause, and often continues for months and years, making, perhaps, in the meantime, very little progress. The syphilitic ulcer is usually distinguished by its excavated character, its spreading tendency, and the copper-colored appearance of the adjacent parts.

5. *Softening.*—Softening of the uterus is generally the result of acute inflammation, as is evinced by the rapidity of its progress, the nature of its symptoms, and its anatomical characters. When it exists in a high degree, it may lead to rupture of the organ, or prove fatal by inducing gradual exhaustion. What is remarkable, the lesion is occasionally coetaneous with softening of some of the other viscera, especially the stomach, spleen, and heart. In most cases, it is confined to the neck or inner surface of the viscus, seldom penetrating to, or commencing in, its exterior. Here, as elsewhere, the mollescence presents several stages, running insensibly into each other. In the first stage, the uterine substance is preternaturally flaccid, lacerable, and infiltrated with serosity; in the second, it readily yields under pressure, and may be broken up into a soft, stringy texture, like that of the spleen; in the third, when the disorganization is at its maximum, it is of a semifluid consistence, and scarcely retains any trace of its former character. The softened organ sometimes preserves its natural color, but more com-

monly it is remarkably pale, grayish, or brownish. Occasionally, as when the attending inflammation is violent, and runs its course very rapidly, the color is purple, slate, or black, and occurs in patches, varying in diameter from a split pea to a twenty-five cent piece.

6. *Induration.*—Induration of the womb is most commonly met with as an effect of old age, or as a consequence of protracted chronic inflammation. It is very different from scirrhus, with which, however, it is often associated, as it also sometimes is with encephaloid, fibrous tumors, and other morbid changes. It is characterized by unnatural paleness, and by a dense, firm, and almost incompressible state of the uterine tissues, many of the vessels of which appear to be obliterated. The womb, in this condition, may retain its normal size, or it may be diminished or increased.

7. *Hypertrophy.*—Hypertrophy of the uterus, as a result of healthy nutrition, is very rare. The affection is usually most conspicuous in association with fibrous tumors, in which it is sometimes truly enormous. Thus, in a specimen in my possession, the walls of the organ are nearly two inches in thickness, and of a firm, dense consistence, grating under the knife. Its cavity is of extraordinary size, and several small tumors are seen projecting from its outer surface. The hypertrophy is sometimes confined to the lips of the uterus, which, especially the anterior, become thick, dense, and stumpy.

8. *Atrophy.*—Atrophy of the uterus arises from various causes. It is by no means uncommon simply as an effect of old age. During the decline of life the viscus increases in density, and exhibits a proportionate diminution in weight as well as in volume; many of its vessels are obliterated, and its cavity is nearly, sometimes entirely, effaced.

Prolonged inactivity will, even at a comparatively early period, cause atrophy of the uterus. In women who have never borne children the organ is often considerably smaller than in those who have been repeatedly pregnant. The uterus, in such cases, is governed by the same laws as the other parts of the body, which are large or the reverse in proportion to the amount of their exercise and the consequent influx of blood.

Continued pressure, as from the presence of a fibrous tumor, an enlarged ovary, or an exostosis of the pelvic bones, may produce this lesion. The proper substance, under these circumstances, is sometimes entirely removed, so that when the organ is distended with air it is almost as thin and diaphanous as a bladder. When the atrophy is carried to this extent, perforation may take place, and the secretions of the organ, if not suspended, be discharged into the peritoneal cavity.

Atrophy of the uterus sometimes occurs during gestation; it may be very slight, or so great that the parietes shall not be more than a line or two in thickness. The causes of this form of atrophy are not understood. It may be accompanied by loss of color and cohesion; or the organ may retain its natural complexion and firmness. Gestative atrophy of the uterus is frequently followed, especially during labor, by laceration.

The *mouth* of the uterus is sometimes preternaturally small, or so much contracted as scarcely to admit a silver probe, or even a hog's bristle. This lesion is often congenital, but in other cases it is brought about by inflammatory irritation, in the same manner as stricture of the urethra. A similar condition is sometimes observed in the cavity of the neck of the uterus. The canal, in one of my specimens, is completely occluded, for the distance of nearly an inch, by the adhesion of its two walls. A stricture in either of these situations would be a cause of impotency and of the retention of the menstrual fluid.

9. *Enlargement of the Mucous Follicles.*—Chronic inflammation of the uterus is often attended with an extraordinary development of its mucous glands. The enlargement is most conspicuous about the mouth and lips of the womb, where the follicles are sometimes as big as a hemp-seed, a currant, or even a pea, dense, almost gristly, and of a white grayish color, as in Figs. 309 and 310. The parts between them are generally tumid, red, morbidly sensitive, and disposed to bleed. In several cases, I have seen the enlarged glands transformed into considerable cysts, filled with a pale, tremulous substance, easily removed by pressure. It is in this manner, perhaps, that the greater number of diseases of the mouth of the uterus originate.

Fig 309.

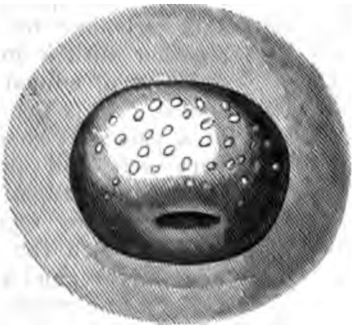
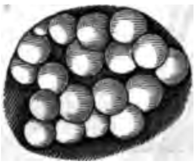
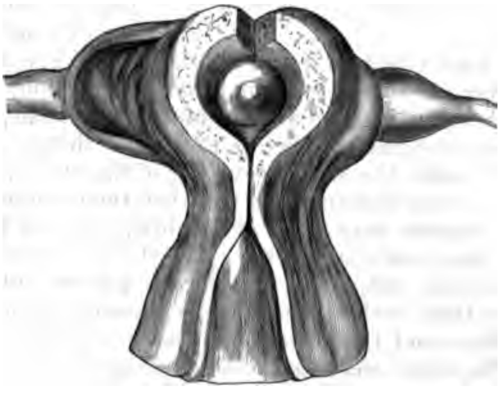


Fig. 310.



10. *Fibrous Tumors.*—One of the most common appearances observed in the uterus is the development of fibrous tumors (Figs. 311 and 312),

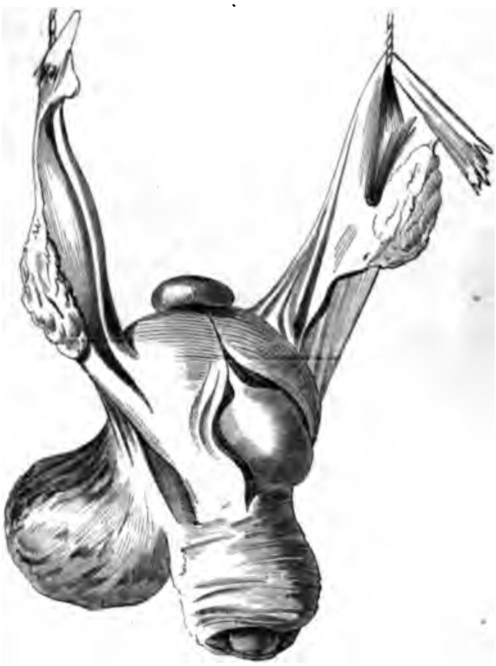
Fig. 311.



Fibrous tumor in the cavity of the uterus. From a preparation in my cabinet.

occurring either in its substance, in its cavity, or on its outer surface beneath the serous coverings. Their shape is usually spherical; their diameter from the size of a hickory-nut to that of a melon; their structure firm, dense, opaque, and of a light grayish color, tearing into strong, concentric fibres. Such growths have sometimes a rough, granulated texture, and not unfrequently they contain small cavities, filled with earthy matter, or various kinds of fluids, as serum, jelly, blood, or pus. The calcareous matter, which, in some instances, almost encases these morbid growths, in the form of a thin, brittle shell, not unlike that of an egg, has been shown, by Dr. Bostock, to consist chiefly of the phosphate and carbonate of lime, together with a minute quantity of animal substance. It is generally of a pale grayish color, very soft, and porous, like pumice-stone; but examples are recorded where it had the hardness of ivory, and admitted of a fine polish.

Fig. 312.



Fibrous tumors of the uterus—both internal and external. From a preparation in Professor Meigs's collection.

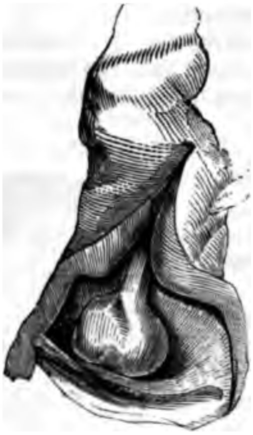
Only one such tumor may exist in the uterus; or there may be a considerable number, perhaps as many as six, eight, ten, or a dozen. When large, they are usually irregularly lobulated, or divided by deep fissures; bloodvessels, often of considerable magnitude, can be traced into their substance. They have no disposition to ulcerate, to become soft, or to assume malignant action; and, although they occur both in the married and the unmarried female, they seldom, if ever, make their appearance before the age of thirty.

When seated under the serous covering of the uterus, these tumors often hang by a very slender neck, and they then assume a pyriform shape. They possess very little sensibility; and, so long as they remain small, they produce no change in the form of the uterus, or local inconvenience; but, when they attain a large bulk, they often incommode by their weight, and, by the pressure which they exert upon the bladder and the rectum, may seriously interfere with the expulsion of the urine and feces. When these bodies are embedded in the walls of the womb, or spring from its inner surface, the subjects of them are apt to be barren; or, if they conceive, the uterine tissue is unable to undergo the necessary expansion, and abortion results. Sometimes these tumors are attached to the base of the womb, and, by rising into the abdomen, may be felt movable in that cavity, and thus simulate pregnancy. When situated in the uterine cavity, they are occasionally expelled during labor, and the woman either recovers, or dies of the profuse hemorrhage that ensues.

11. *Polypes.*—Polypes of the uterus may be conveniently arranged, according to their anatomical characters, into four classes, namely, the fibrous, vascular, vesicular, and granular.

The *fibrous* variety bears a strong resemblance to the fibrous tumor of the uterus, and is perhaps the most common of the four. Growths of this kind are of a fleshy consistence, firm, yet compressible, smooth, elastic, of a pale grayish color, and composed of dense filaments, which are so intimately interwoven with each other as to render it impossible to unravel them. In their shape, they are commonly globular or pyriform; in one instance, I found one that was of the figure of a mushroom, the rounded footstalk being attached to the neck of the uterus, the base projecting into the vagina (Fig. 313). The fibrous polype has few vessels and nerves, and is therefore little liable to bleed or to be attended with pain. Tumors of this kind have often a very rough surface, and they sometimes contain considerable cavities filled with serum, jelly, pus, or earthy matter.

Fig. 316.



Fibrous polype of the uterus. From a preparation in my collection.

The *vascular* polype is composed essentially of vessels and cellular tissue, the fibrous element being either entirely wanting, or existing only in a very limited degree. This species is extremely rare, and seldom attains a large size; it is of a red, florid color, of a soft spongy consistence, sensitive on pressure, erectile, and exceedingly prone to hemorrhage. In respect to shape, it presents the same diversities as the other species.

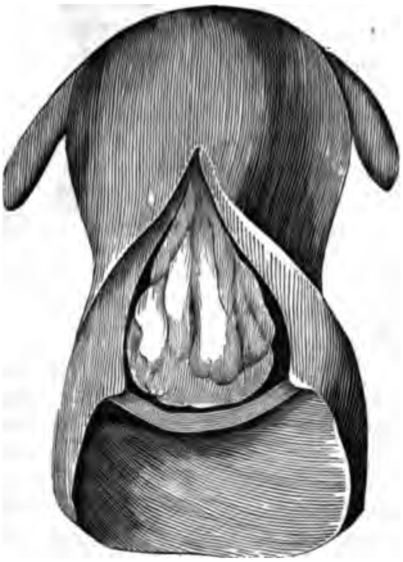
The *vesicular*, cellular, or gelatinoid polype holds a sort of intermediate rank between the two preceding, being softer than the fibrous and harder than the vascular. This species is readily distinguished by the following characters:—It is semi-transparent, of a peculiar grayish complexion, compressible, glistening on the surface, and attached by a delicate pedicle, which renders it pendulous. Carefully examined, it is found to exhibit a shreddy, tremulous structure, interspersed with a few vessels, which are generally too small to emit much blood. The gelatinoid polype may acquire a large bulk, and is influenced by atmospheric vicissitudes, increasing in size when the weather is moist, and diminishing when it is dry.

The *granular* polype consists in an enlargement of one or more of the mucous follicles, situated at the mouth of the womb, and described by the older writers under the name of the ovules of Naboth. It almost always occurs in clusters, of a whitish or grayish color, commonly about the size of currants or grapes, suspended by long, slender pedicles, and strongly resembling, in their general appearance, the surface of a cauliflower. When there is only one such tumor, it may attain the volume of a walnut, or of a hen's egg. It is invested by a smooth, delicate, vascular membrane, possesses little sensibility, and often contains a yellowish curdy matter, which is apparently nothing but inspissated mucus. The connection with the uterus is very slight, and its growth generally very tardy.

Such are the distinctive characters of the four species of uterine polypes now described. To these it will be necessary to add a few remarks respecting certain features which they possess in common with each other.

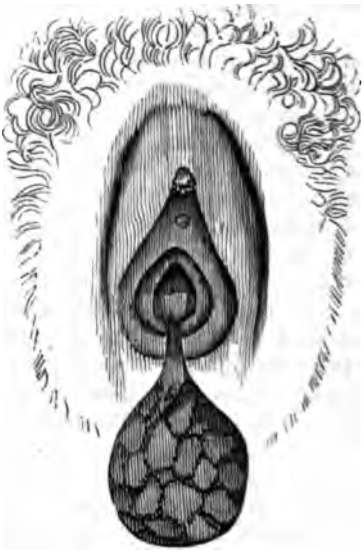
Uterine polypes are found of all sizes, from that of a bean up to that of a gourd. Fig. 314 represents a small tumor of this kind, of a pear-like, lobulated form, and attached to the base of the cavity of the womb by its footstalk. Their volume, in some cases, is immense. Dupuytren saw one which weighed twenty-five pounds; and another, described by De Claubry, weighed thirty-nine pounds, and was nearly three feet in its vertical circumference. They occasionally extend far down into the vagina, and cases have been witnessed in which they reached more than ten inches below the vulva. (Fig. 315.) The shape of these morbid growths is mostly pear-like; and, although they may originate in any portion of the cavity of the uterus, they are most frequently attached to its neck. Many of them have a narrow, slender

Fig. 314.



Uterine polype attached to the base of the organ.

Fig. 315.



Uterine polype hanging from the vulva.

peduncle; and, in such as are of great size, it is not uncommon to see deep fissures, which give them a lobulated arrangement. They are all invested by a thin mucous membrane, which is more or less vascular, and merely a prolongation of that of the womb, immediately beneath which the morbid growth is developed.

Uterine polypes often contain large cavities, filled with various substances. Earthy concretions have been found in their interior, and some have pretended that they have detected tubercular matter. Waller alludes to cases in which they contained hair. These tumors are most common in aged females. A notion, but a very erroneous one, was formerly entertained that they occurred most frequently in old maids; instead of this they are by far most common in married women, the mothers of children. Their presence often occasions alarming hemorrhage; and, when they become ulcerated, they may give rise to a copious discharge of irritating and offensive matter.

12. *Transformations.*—Calculous concretions sometimes occur in the uterus. Of these formations many cases are described by the older writers, and not a few by those of a more modern date. One of the most interesting examples, perhaps, on record, is that related by Louis, in the Memoirs of the Royal Academy of Surgery of Paris.[1] It was observed in an old female, who was affected for a long time with difficulty in voiding her urine, and severe pain in the loins and perineum. The uterus, which was in a state of scirrhosity, and of extraordinary size, contained a hard, compact, and irregularly-shaped concretion of a bony structure, which weighed five ounces and a half. Generally, however, these heterologous formations are much smaller, not exceeding the volume of a grape, a pigeon's egg, or a walnut. Most of them are of a light grayish color, of an osteo-cretaceous character, and somewhat lamellated, with a rough, unequal surface. They all essentially consist of carbonate of lime, in union with a little animal matter.

Concretions of this sort are sometimes surrounded by a delicate membrane provided with minute vessels; and they not unfrequently contain small nodules of cartilage. Although their most usual situation is the cavity of the organ, yet they are occasionally developed in its substance, beneath its serous investment, or even in the uterine veins. When seated in the proper cavity of the womb, nature sometimes makes an attempt to expel them, which is almost always attended with considerable hemorrhage. At other times, though very rarely, their presence excites ulcerative action, leading to great local suffering and the formation of fistulous tracks between the uterus and the adjacent viscera. Calculous concretions are most commonly observed in advanced life; in a few instances they have been witnessed in young females, married as well as single, soon after the establishment of the menstrual function.

How these concretions are developed is still a litigated question. I have already described the formation of similar bodies in the plastic lymph of the serous membranes of the joints and of the visceral cavities; and it is not improbable that those under consideration have an analogous origin. It is well known that the uterus is liable, at all periods of life, but especially in old females, to the effusion of fibrin, either into its cavity, into its substance, or into the submucous cellular tissue. In either case, the fluid, if it be permitted to remain, becomes organized, and converted ultimately into an adventitious structure of a fibrous, fibro-cartilaginous, cartilaginous, or osseous character. It is possible that they may also be produced by the presence of coagula, formed during uterine hemorrhage; and it is probable, likewise, that in some rare instances the earthy matter is poured out without being preceded by any new growth, whether of an analogous or heterologous nature. This hypothesis derives support from the fact that these concretions are occasionally found entirely disconnected from the substance of the womb, lying perfectly loose in its cavity, or upon its outer surface.

---

[1] T. ii., 4to. edit., 1769.

The uterine tissue may be partially *transformed* into cartilage, bone, or earthy matter. The foreign substance is generally seated in the proper texture of the organ, but occasionally it is lodged in the submucous cellular tissue, and appears to be encysted. Louis, in his Essay on Calculous Concretions, previously alluded to, quotes an instance in which the parietes of the uterus were so completely ossified as to require to be broken with a hammer; the organ was of enormous size, and contained a considerable quantity of thick purulent matter. In another case, referred to by him, the internal surface of the womb was studded with numerous projections, of a yellowish color, and a firm, rock-like consistence, bearing a striking resemblance to stalactites. "I have seen a uterus," says Dr. Hooper,[1] "the size of an adult head, irregular on its surface, and formed wholly of hard bony matter, surrounded by the expanded fibres of the organ, and in many parts covered only by the peritoneum." Such transformations are, however, extremely rare. They occur almost exclusively in females past the age of forty-five, and they appear to be produced by a perverted action of the uterine vessels, caused probably by chronic irritation. It would be interesting to ascertain, if this could be done, how far these deposits are connected with similar lesions of the arterial system.

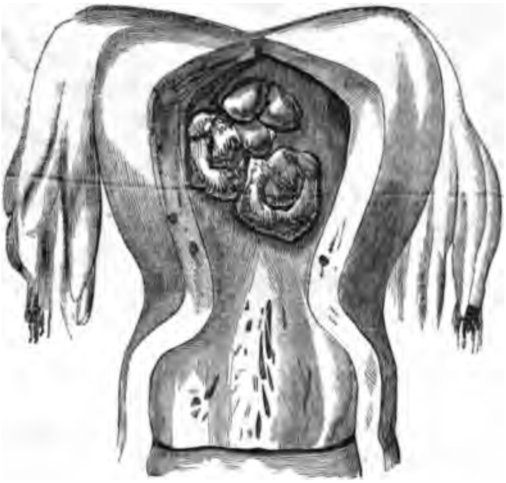
13. *Carcinoma.*—The womb is often the subject of malignant disease, described by authors under the several denominations of scirrhus, fungus hæmatodes, cauliflower excrescence, corroding ulcer, and carcinoma. Scarcely any one of these appellations seems to me to be well chosen, as they have reference rather to certain states or appearances of the parts than to their true nature and constant anatomical characters. Not unfrequently all the conditions expressed by these terms are blended together, and, even when they exist separately, they have invariably the same tendency, namely, that of destroying the different textures of the uterus and the adjacent viscera.

Malignant disease, be its nature what it may, generally begins at the neck and lips of the organ, from which it gradually ascends to the other parts. So common is this mode of attack that it was once supposed to be invariable in its occurrence. Recent observations, however, prove that there are numerous exceptions to this rule, and that in many cases the disease, instead of showing itself first in the parts just mentioned, commences at the base or body of the organ, thence spreading downwards so as to manifest itself last in its inferior extremity. The origin of cancer in the cavity of the organ is well shown in the adjoining sketch.

---

[1] Morbid Anatomy of the Human Uterus, p. 14. London, 1832.

Fig. 316.

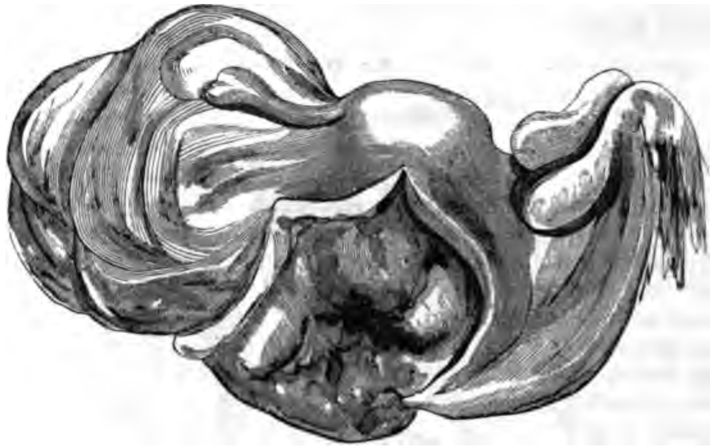


Incipient cancer beginning in the body of the uterus. From a specimen in my collection.

The mouth of the womb in this affection usually becomes hard, thick, and irregular, the lips being everted, painful on pressure, and bleeding not unfrequently on the slightest touch. One, indeed, of the earliest symptoms is hemorrhage, not slight, but severe, long-continued, and recurring, with more or less frequency, throughout the whole progress of the malady. It is a symptom, therefore, of great diagnostic value, especially in the inceptive stage of the complaint. After this state has continued for some time, ulceration takes place, a thin, sanious fluid, abundant in quantity and highly irritating in quality, oozes from the vagina, and all the textures of the affected part are completely destroyed. The base and body of the uterus, which are often much enlarged, also change their appearance; they become hard and firm, like fibro-cartilage, and are intersected by dense, grayish filaments running in a radiating direction. In some instances, the organ, when cut, has a raw flesh-colored aspect, like a slice of fresh pork; this is called the *lardaceous* degeneration of the uterus. In other cases, it has a *gelatinous* structure; and, in a third variety, as the softening and ulceration proceed, it assumes the color and consistence of *encephaloid.* The annexed cut (Fig. 317) affords an excellent illustration of carcinoma of the uterus beginning at the mouth and neck of the organ, and gradually extending upwards towards its body.

The brain-like variety of the disease generally occurs in the form of soft, lobulated masses, the interior of which contains clots of fibrin varying in color and consistence according to the length of time they have been deposited. Their size seldom exceeds that of an orange, but sometimes they are as large as a fœtal head, of an irregularly globular figure, and of a dark brownish complexion, caused by the secretion of melanotic matter. In other cases, again, though these are rare, the internal structure is of a deep red color, and composed essentially of anastomosing vessels.

Fig. 317.



Carcinoma of the uterus beginning at the mouth and neck of the organ. From a preparation in Professor Meigs's collection.

As the disease progresses, various morbid growths spring from the ulcerated surface, and fill up the vagina. These at length fall off by sloughing, and are either speedily succeeded by others, or they leave a deep excavated sore, with hard, irregular edges. In this stage of the complaint, there are generally copious discharges from the vagina, consisting of a thin, corroding sanies, serum, pus, or sero-purulent matter. In many individuals such discharges are exceedingly fetid, and at once serve to point out the true nature of the lesion.

Carcinoma of the uterus is most common about the decline of the menses, in married females that have borne children. In 409 cases of cancer of the uterus, examined by Madame Boivin and Professor Dugès,[1] the period of life was as follows:—

| | |
|---|---|
| Under twenty years of age . . . . . . . | 12 |
| From twenty to thirty . . . . . . . . | 83 |
| From thirty to forty . . . . . . . . | 102 |
| From forty to forty-five . . . . . . . . | 106 |
| From forty-five to fifty . . . . . . . . | 95 |
| From fifty to sixty . . . . . . . . . | 7 |
| From sixty to seventy . . . . . . . . | 4 |
| | 409 |

Thus it would seem that nearly as many patients die between the ages of forty and fifty as in all the other periods of life conjoined.

---

[1] Practical Treatise on Diseases of the Uterus, translated by Heming, p. 231.

Before the twentieth, and after the fiftieth year, the disease is very infrequent; owing, doubtless, to the want of activity of the uterine organs.

The period at which carcinoma of the uterus proves fatal varies in different cases and under different circumstances. Of 120 cases, reported by Dr. J. C. W. Lever, of London, 107 died at an average period of twenty months and a quarter from the invasion of the malady. The shortest duration was three months, the longest five years and a half. Marriage and the previous state of the health did not appear to have exercised any particular influence upon the progress of the disease.

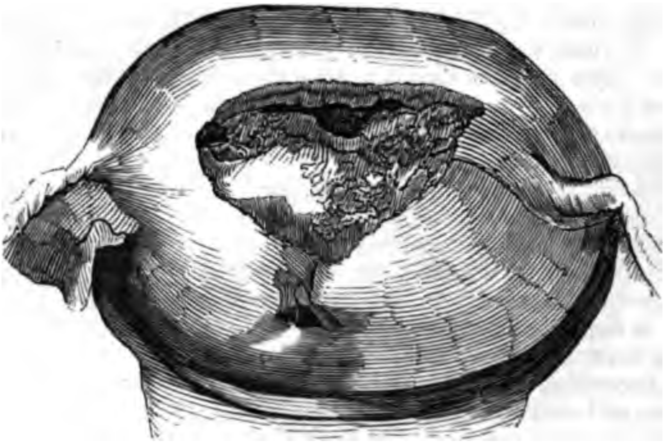
14. *Tubercles.*—Tubercular matter, such as we find in the lungs, seldom occurs in the uterus, and then perhaps never before the age of puberty. It is usually deposited upon the inner surface of the organ, which is sometimes entirely incrusted with it, forming a layer a line or more in thickness. In some instances, though this is rare, the matter is deposited into the substance of the womb, or into the cellular texture between it and the peritoneum.

15. *Laceration.*—The uterus, like other hollow viscera, as the heart, stomach, and urinary bladder, is liable to laceration, both in the unimpregnated and in the gravid state. The causes which predispose to this accident are wounds, such as are made in the Cæsarean section, softening of the uterine tissue, irregular contractions, and various organic degenerations, which, although they may increase the thickness of the parietes of the womb, render them more brittle, and thus diminish their power of resistance. The rupture, which may be partial or complete, transverse, oblique, or longitudinal, is most frequent during parturition, within twelve or fifteen hours after the commencement of labor, and most frequently affects the body, neck, and lower segment of the organ; very rarely the fundus or upper part.

Of 230 cases of this lesion, related by Dr. Nevermann, 62 occurred during pregnancy, and 168 during labor. "Of the latter, eighty affected the body of the uterus, nine running in a transverse direction, and sixty-eight longitudinally, and extending backwards and to one side: in three cases the fundus was perforated partly by the feet of the child, partly by previous ulceration, and in one instance only the fundus was rent. In thirty-six cases the neck was torn longitudinally, and in fifteen transversely. In four cases the uterus was torn away from the vagina, and in twenty there was merely a small perforation of the body or neck. In the other cases the seat of the rupture is not mentioned."

"The rupture does not always extend through the whole of the substance of the uterus. In four cases the peritoneum only was torn, and in five cases the uterus was torn and the peritoneum uninjured; and, in all these apparently slight cases, death ensued. The size of the lacerations varies much; some have been seen only a quarter or half an inch in length, others nine inches long, or even involving two thirds of the uterus. Sometimes the rupture is merely a small, round hole, through which fatal hemorrhage takes place." Fig. 318 is a laceration of the fundus of the uterus. The laceration, as just stated, is sometimes limited to the peritoneal investment of the uterus, extending in an oblique, horizontal, or diagonal direction. It is most common at the postero-inferior surface of the organ, at the part which corresponds with the promontory of the sacrum, and is apparently caused by the force in which the child, in the act of parturition, is impelled against this portion of the womb.

Fig. 318.



Laceration of the womb. From a specimen in the University of Louisville.

All obstetricians bear witness to the rarity of this accident in first labors. Of 83 cases recorded by Collins, Robertson, and McKeever, 10 only occurred under these circumstances. Dr. Nevermann finds, on a comparison of 406,081 labors, that the uterus was ruptured 85 times, or in the proportion of 1 to 4,777.

16. *Hemorrhage.*—Of hemorrhage of the uterus I shall speak only as it affects the organ in the unimpregnated state. Contemplated under this restriction, the occurrence is most common in married females, about the cessation of the menstrual function, and is observed in every state of constitution, in the strong and plethoric, as well as in the feeble and relaxed. A great variety of causes may give rise to uterine hemorrhage; but the most frequent by far is that peculiar state of the system which accompanies the disappearance of the menses, together with ulceration of the mouth of the womb, or the presence of some adventitious growth. Disease of the ovary also powerfully predisposes to this lesion; and there are some females who are naturally, or from habit, so prone to it that the most trifling exertion is sufficient to bring on an attack. The duration of the hemorrhage varies from a few days to several weeks. When dependent upon structural disease, or the presence of a polypous tumor, the blood often comes away suddenly, in a gush, which continues, at intervals, for a few hours, and then ceases.

The effused blood is generally of a dark red color, and comes away in coagulated masses, though occasionally, especially when the hemorrhage is sudden and profuse, it is of a fluid consistence, as well as of a lighter tint. With regard to its quantity, it may vary from a few ounces to several quarts; and, although it is generally greatest when it proceeds from a ruptured vessel, it is often not less abundant when it has its source in exhalation of the mucous membrane. On dissection, we find the surface of the womb either of a uniform red color, or mottled with blackish spots, soft and corrugated, with here and there a submucous ecchymosis. The whole organ is commonly somewhat relaxed, and, on cutting through its substance, small clots of blood are occasionally observed, resembling apoplectic effusions of the brain.

17. *Dropsy.*—Large quantities of water—ten, fifteen, and even twenty quarts—have been known to accumulate in the cavity of the womb. The affection, however, is extremely rare, and is always connected with closure of the mouth of the organ, caused by previous inflammation, malignant disease, or some morbid growth. The fluid is generally clear and limpid like the serum of the blood, which it also resembles in its chemical properties. In some cases it is thick and turbid; it has also been found of the color and consistence of coffee-grounds, from the admixture, probably, of sanguineous matter. The tumors thus formed often simulate pregnancy, are painful on pressure, and slightly fluctuate under the fingers. The disease, which is technically called *hygrometra*, is occasionally connected with utero-gestation, of which it forms one of the most distressing complications. Its true pathology is still involved in obscurity. In all probability it is dependent upon chronic inflammation of the lining membrane of the womb.

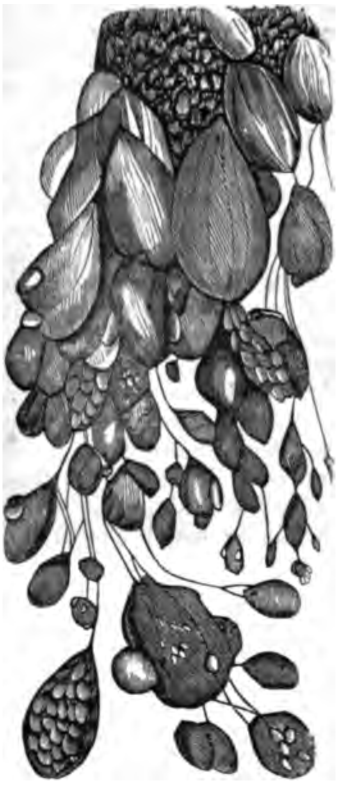
18. *Collections of Gas.*—Air now and then collects within the cavity of this viscus, constituting the disease which has been described by pathologists under the name of emphysema, physometra, and tympanites. How this is formed is still a litigated point. In many cases, it can be traced to the decomposition of effused fluids, as blood, serum, or pus; in others, it is not unlikely that it is the product of a true secretion from the uterine vessels, brought about by some morbid condition, the precise nature of which is unknown. These accumulations may take place at any period of life, in the married and single, the young and old. When considerable, they cause the womb to expand and rise up in the abdomen, as in pregnancy, with which it may be easily confounded. After the flatus has existed for several months, the uterus commonly makes an effort to dislodge it, expelling it with a noise somewhat similar to what is occasioned in eructation.

19. *Hair.*—The uterus has been known to contain hair, either by itself, or in union with other substances, as water, fat, decomposed skin, or pieces of bone. The subjects of this occurrence have always been married females, who were delivered some time previously of a dead child, from which the hair is doubtless derived, as it is impossible to conceive of such a formation independently of the process of impregnation. Hysterical women have been known to introduce hair into the vagina to excite the curiosity of their friends.

20. *Hydatids.*—We sometimes find hydatids in the uterus, though not so frequently as as has been generally imagined. The number

of these bodies is often immense. In a specimen in my collection, notwithstanding a great many were lost during the delivery, there are at least ten thousand, of all sizes between an almond and a mustard-seed (Fig. 319). In their shape, these bodies are either globular, pear-like, or conoidal; and they are usually strung together by an intricate plexus of pedicles, which ramify in every direction, and are frequently not thicker than a common sewing-thread. The length of these stems varies from a few lines or less to several inches; they are of an irregularly cylindrical figure, and from two to six are occasionally attached to the same vesicle; their strength is always very slight, so that they break with great ease; and many of them, though not all, are distinctly tubulated, being inflatable from the hydatids with which they are associated. The canal, however, does not generally extend through the whole length of the foot-stalk, but only a comparatively short distance; seldom, indeed, more than six lines or an inch.

Fig. 319.



Hydatids of the uterus. From a preparation in my collection.

The larger hydatids have generally smaller ones attached to different parts of their surface, an arrangement not unlike what is observed in some tuberous roots. From five to ten, not bigger than a grain of barley, are often seen sprouting out in this way, their connection with the parent parasite being effected by means of a narrow, delicate stem, scarcely half a line in length. But, whatever may be their size or form, they all adhere, directly or indirectly, to one common stalk, exactly like a bunch of grapes, and which consists either of a portion of degenerated placenta, a fibrinous concretion, somewhat similar to an ordinary mole, a blighted ovum, or the remnants of the fœtal envelops. These are, I conceive, highly important circumstances in the history of these singular productions, inasmuch as they fully confirm the opinion, so warmly advocated by many writers, but so strenuously denied by others, that hydatids are never found except as the result of impregnation.

When carefully examined, each vesicle is found to have three distinct coverings, which may generally be separated without much difficulty with the knife, care being taken to hold the morbid growth under water during the dissection. The external tunic is extremely delicate, almost like a film, and of a pale cineritious color, which becomes more perceptible when it is detached from the subjacent layer; it is easily lacerated, semi-transparent, and may be considered as a sort of deciduous membrane. The second lamella, on the contrary, is comparatively thick, firm, dense, and resisting; it has a whitish appearance, possesses the property, in some respects, of a fibrous texture, and serves at once to give shape and consistence to the vesicle which it assists in forming. Within the two coverings now described lies the hydatid, properly so called, which is generally so weak as to break under the pressure of the atmosphere, and which appears to consist merely of a thin, lymph-like sac, filled with serous fluid. In the recent state, this lamella is perfectly smooth and transparent; but, by immersion in alcohol, it speedily becomes opaque and corrugated. In most cases the parasite lies loosely within its envelops, but occasionally, especially when the vesicles are old or of large size, there is a pretty strong adhesion, by means of thread-like filaments, between them. Its contents are clear and limpid, like the purest spring water, slightly saline to the taste, and partially coagulable by heat, alcohol, and dilute acid.

It has been already seen that the number of these bodies is sometimes extremely great. By their agglomeration large masses are formed, the weight of which has been known to exceed ten pounds. These masses are generally expelled piecemeal, and they are rarely, if ever, enveloped by distinct fœtal membranes, unless there are at the same time remnants of a blighted ovum.

The period of hydatic gestation, as might be supposed, is extremely variable. The following table, which I have compiled from Madame Boivin and other writers, gives an accurate view of the duration of this disease in forty-four cases, including five that have been communicated to me by medical friends:—

| Duration of the disease. | Number of cases. |
|---|---|
| 3 months | 4 |
| 4 " | 3 |
| 5 " | 3 |
| 6 " | 5 |
| 7 " | 6 |
| 8 " | 7 |
| 9 " | 10 |
| 10 " | 3 |
| 11 " | 1 |
| 13 " | 1 |
| 14 " | 1 |
| | 44 |

From this table it appears that the number of hydatic births, if so they may be styled, is, within a fraction, twice as great after the sixth month as anterior to that period. Delivery never occurs, so far as my knowledge extends, before the expiration of the third month. The mean duration of this species of pregnancy, calculated from the above cases, is a little more than seven months, provided we receive as correct—which I am disposed to think we should not—the examples of Baudelocque, Vernois, and others, where the female is said to have carried the morbid product more than a year.

It has been supposed that hydatids of the uterus are most common in women about the decline of the menses; but this opinion is evidently grounded upon superficial observation. Of thirty-one cases, in which the age is satisfactorily stated, I find that twelve occurred between the twentieth and thirtieth year: eight between the thirtieth and fortieth; and eleven between the fortieth and fiftieth, or rather between the fortieth and forty-sixth; for beyond this period I am not acquainted with a single well authenticated instance in which this degeneration was observed.

The development of these parasites is generally, if not invariably, preceded by one or more normal gestations. In a case, the particulars of which were communicated to me by Dr. Dunlap, of Greenfield, Ohio, the woman, who was forty-six years old, and had always been in the enjoyment of excellent health, had given birth to eleven children. Occasionally these bodies form in several successive pregnancies; and in a few rare instances they have been observed in several members of the same family.

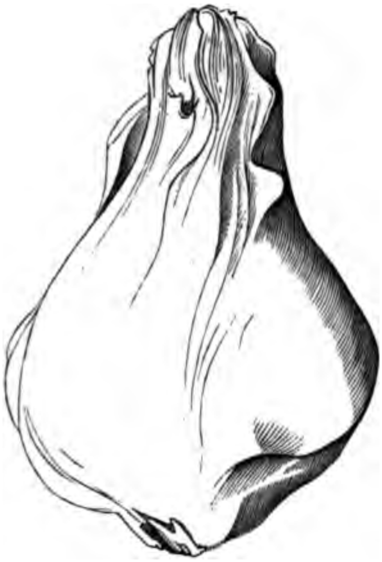
The expulsion of the hydatids is almost constantly attended with more or less hemorrhage. To this statement, indeed, there are few exceptions. A discharge of blood frequently takes place at a very early period of gestation, and recurs at variable but generally short intervals, until the time of parturition. The quantity of blood lost is often so great as seriously to undermine the vital powers, or even destroy the patient. The expulsion of these bodies is always accompanied by labor pains.

As to the causes of these morbid growths, they are enveloped in complete mystery. It has been conjectured by many that they are occasionally an original production of the uterus; but there is no case on record, so far as I know, which warrants such a conclusion. Indeed, when we reflect upon the fact, already adverted to, that they always occur in association with mole-like concretions, the membranes of a blighted ovum, or some remains of the fœtus itself, or finally, with portions of the placenta, in a state of degeneration, it must be conceded that they are invariably the result of impregnation. If this view be adopted, it follows, as a natural deduction, that the development of the new being is arrested and another action set up, under the influence of which the bodies in question are created. What the nature of this action is, we cannot of course determine any more than that which presides over ordinary generation.

21. *Moles.*—The last subject to be discussed is that of uterine moles. Under this term authors have described different, and often very dissimilar products, which, after continuing for a variable period in the womb, are finally expelled with all the phenomena of ordinary labor. I shall divide uterine moles into two species, the fibrinous and the vascular. This arrangement, it will be perceived, altogether excludes uterine hydatids, which have been referred to this head by certain writers.

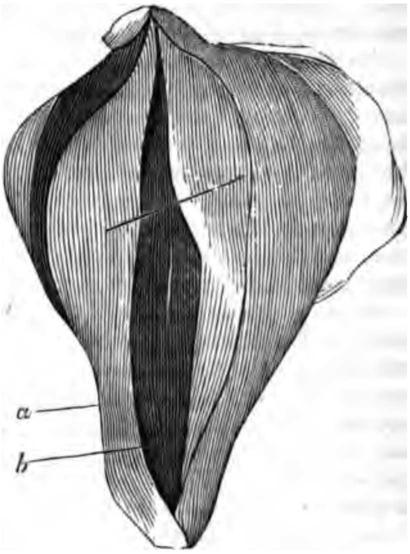
The *fibrinous mole* (Figs. 320, 321, 322) is a much more interesting and intricate structure than we might be led to infer from the im-

Fig. 320.



Exterior of a fibrinous mole.

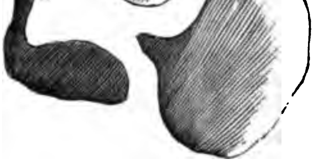
Fig. 321.



Mole cut open, showing its structure: *a.* Chorion; *b.* Amnion.

perfect descriptions of it by authors. In its shape it is always, so far at least as reiterated inspection has enabled me to judge, more or less conical, pyriform, or gourd-like; never, I believe, perfectly globular. Occasionally, though this is rare, it is somewhat lobulated or angular, either externally or upon the inner surface, or in both these situations at the same time. Its size and weight vary very much in individual cases. In five specimens of this species of mole which I have examined with great care, the mean weight was a little more than one ounce, the maximum two ounces, the minimum six drachms. The length, in the same cases, varied from two inches and a half to three inches and a quarter; the width, from one inch and a half to two inches and a quarter; and the thickness, from one inch and a half to two inches.

Fig. 322.



Mole with the cavity communicating externally.

The fibrinous mole, in the recent state, has very much the appearance of a mass of blood, being of a modena color, not uniformly, but darker in some places than in others. It is of a firm, solid consistence, requires a good deal of force to cut it, and emits a dull, creaking sound under the knife, like fibro-cartilage. The degree of induration, however, is not the same in all cases, or even in all parts of the same specimen. When retained long, this species of mole sometimes partially degenerates into a hard, gristly substance, similar to certain transformations of the placenta.

The adventitious product is invested by a grayish, fragile lamella, generally not more than the fourth of a line in thickness. It evidently serves to connect the mole to the inner surface of the uterus, and possesses all the characters of the deciduous membrane. Not only does this lamella cover the exterior of this body, but it usually passes into the internal canal, which it thus lines throughout its whole extent. An instance has been recorded, where the mole was surrounded by an osseous covering, formed, doubtless, by a degeneration of the structure here described.

On making a longitudinal section of this morbid growth, an internal cavity is found which is always remarkably small in proportion to the inclosing parietes. In most instances, it extends nearly from one extremity to the other, at the larger of which, much more frequently than at the smaller, it has an external opening. To this law, which may be regarded as a very important one, I have met with only a single exception in a considerable number of specimens. To attempt to describe the shape of the internal canal would be idle, so much does it vary in different cases. Irregularity is its distinguishing characteristic. Very frequently it presents itself in the form of a fissure, which is sometimes cylindrical, sometimes angular. Equally irregular is the outlet of this canal; whilst in some instances it is small and tolerably well-defined, in others, and these are by far the most common, it is large, grooved, or slit-like. Occasionally it closely resembles the mouth of the unimpregnated uterus.

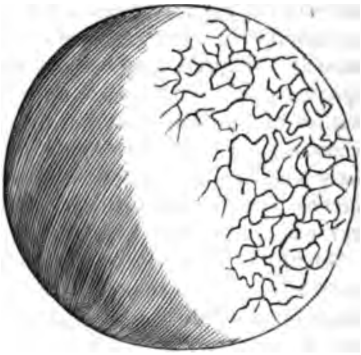
But whatever may be the form and dimensions of the internal canal, or of its outlet, it is always lined by two short sacs, which, though intimately united, are perfectly separable by dissection, and which appear to correspond exactly to the natural envelops of the fœtus. The outer layer is rough, flocculent, and loosely connected with the deciduous membrane, which, as was before stated, is always reflected into the mole when there is an open cavity; the inner, on the contrary, is perfectly smooth and glossy, like the serous tissue in other parts of the body, and generally, though not always, contains a small quantity of transparent fluid, similar in every respect to the amniotic liquor.

The parietes of the cavity just described are always exceedingly irregular, and vary in different parts of their extent from the twelfth of an inch to six or eight lines in thickness. They are composed principally, if not wholly, of the fibrin and coloring matter of the blood, cemented by plastic matter. On making a section of the mole in the direction of the long axis, the outer portion is observed to have an imperfectly lamellated arrangement, and also to be somewhat more compact than the internal parts, which are of a much darker complexion, homogeneous, much more friable, and almost entirely made up of coagulated blood. In some instances, the walls are essentially fibrous, the fibres extending longitudinally from one extremity, or nearly so, to the other. Lying in close, parallel lines, they are very coarse, easily torn, as well as easily separated from each other, and of a reddish-gray color, being darker at some portions than at others. These three varieties of structure are not unfrequently met with in the same tumor, the linear arrangement being seen at the apex, the lamellated at the external part of the body, and the uniform, homogeneous, or hematoid towards the centre.

The cellular tissue entering into the composition of this variety of mole is usually very small in quantity, and is often so intimately incorporated with the morbid mass as to be perceptible only after protracted maceration. Its vessels, which are generally quite large, may be seen ramifying over its outer surface, running, for the most part, in the direction of its long axis. They enter the new product at various points, but none can be traced beyond the depth of a few lines: they are sometimes quite varicose, their parietes are remarkably brittle, and they have altogether much more of a venous than of an arterial character. The anastomoses which exist between these vascular trunks are commonly very imperfect; a circumstance which, with the delicacy of their structure, renders them exceedingly liable to congestion, rupture, and hemorrhage.

The second species of mole may be called the *vascular* (Fig. 323), in consideration of its structure, which, as the term imports, is essentially of that nature. It is much more rare than the preceding, but in what proportion it occurs we have no means to determine. In its shape, the vascular mole is generally globular, its diameter varying from one to four inches. Its weight, after the discharge of its contents, ranges from three drachms to one ounce, according to its dimensions, or the thickness of its parietes.

Fig. 323.



In regard to its structure, this variety of mole may be said to bear a striking resemblance to the placenta. Like it, it appears to be essentially composed of bloodvessels, which freely anastomose with each other, and are bound together by delicate, cellular tissue, the whole forming a soft, spongy substance, the thickness of which rarely exceeds the sixth of an inch. In some instances, numerous intersecting filaments may be observed, which are either of a fibrous nature, or obliterated arterial and venous ramifications. The mole is covered by a thin, coriaceous lamella, which is much more delicate than in the fibrinous form; internally, it is furnished with two distinct membranes, one answering to the chorion, the other to the amnion. They are much more perfectly developed than in the preceding variety, as well as more easily separable from each other; and the latter always incloses a considerable quantity of watery fluid, occasionally, indeed, as much as three or four ounces.

Such is a brief account of the two species of uterine moles. The period during which they are retained in the womb is liable to some variation, but in the generality of cases it does not exceed three months. In a few instances I have known them to come away as early as the end of the tenth week, and on one occasion as late as the middle term of normal gestation. Their expulsion is invariably accompanied with more or less hemorrhage, which is sometimes so profuse as to endanger life. The parturient efforts are usually very feeble, and often occupy from two to three days.

The fibrinous mole has occasionally been observed in company with a healthy or diseased fœtus; and I have a specimen of the vascular variety, in the interior of which are the remains of an umbilical cord. Like hydatids, these products may occur in several successive pregnancies; and they have been noticed at all periods, from the age of puberty to the decline of the menses. Their development is commonly attended with the phenomena of ordinary gestation.

It is supposed by many that these bodies are never formed except as a consequence of conception, an opinion which is in perfect accordance with the result of my own observations. I speak now, of course, of what I consider to be the true genuine mole; that is, *an organized body of a certain or determinate form and structure, having an internal cavity, either closed or open, and lined by two distinct membranes of the character here ascribed to them.* Such a product, no matter whether it be fibrinous or vascular, I do not hesitate to say, on the authority of personal experience, is never developed in the virgin uterus. I have never seen an example of what some have called a *spurious mole*—a dense, compact, and amorphous mass, composed essentially of clotted blood—but such a substance might form, there is reason to believe, in females during the period which intervenes between the establishment and the decline of the menses, without intercourse or the stimulus of conception, simply from the effusion and retention of a small quantity of organizable blood.

Of the causes of the true mole we have no definite knowledge. We may suppose, however, in the absence of positive facts, that the uterus, instead of providing for the growth and nourishment of the new being, as nature has designed it should, takes on inflammatory irritation, which is followed by the destruction of the germ, the effusion of blood, and the formation of an abnormal structure, which, as we have already seen, is sooner or later detached and expelled.

## SECTION II.

### OVARIES.

The ovaries are two small oblong bodies of a light grayish color, and of the volume nearly of a common almond. With regard to their weight, much diversity obtains in the different periods of life, as well in the single as in the married state. In eight young females, who died between the ages of seventeen and twenty-three, and in whom, from their previous health and moral habits, there was every reason to believe that the ovaries were perfectly natural, I found the mean weight to be one drachm and a quarter, the maximum one drachm two scruples and a half, and the minimum fifty-six grains. With respect to their dimensions, the mean length of the organs, measured in the same subjects, was seventeen lines, the breadth nine lines, and the thickness four lines and a half. In women who have borne children, the ovaries are generally about half a drachm heavier, and they are also broader and thicker, but seldom any longer. Their volume is always disproportionably great in early childhood; but from the eighth to the twelfth year they undergo little change in this respect; from this period on, however, they gradually augment in size, until puberty, when they attain their full development.

The ovaries are subject to inflammation, suppuration, softening, tubercles, melanosis, scirrhus, encephaloid, fibrous growths, and serous cysts. Few of these affections occur before puberty, and they are much more common, as a general rule, in the married than in the single.

1. *Inflammation.*—The anatomical characters of acute ovaritis are increased vascularity, softening, and sero-purulent effusion. In violent attacks, the organ is of a deep red color, much swelled, and gorged with blood. On cutting into the parenchymatous structure, it will be found succulent, and pervaded by globules of pus, or converted into a pulpy, disorganized mass. When the disease affects the albugineous and serous coverings, lymph is apt to be poured out, sometimes in great quantities, by which the ovary is embedded, and firmly attached to the adjoining viscera. In such cases the gland is liable to be permanently fixed to the sigmoid flexure of the colon, the bladder, the body of the womb, and even the fimbriated extremity of the Fallopian tube.

Ovaritis, especially the puerperal variety, sometimes passes into *suppuration.* The matter is commonly of a thick cream-like consistence, such as occurs in phlegmonous abscess, and it may be either infiltrated into the parenchymatous structure of the organ, or collected at one or more points. The quantity of fluid, though usually small, is sometimes almost incredible. In a case of chronic ovaritis, observed by Dr. Taylor, of this city, it amounted to sixteen quarts. The right ovary occupied the whole of the abdominal cavity, and was converted into a large vascular sac, weighing seventeen pounds after the removal of its contents. The matter thus formed may escape into the pelvic cavity, the rectum, vagina, or urinary bladder. In some cases it finds its way into the bowels; and occasionally it has been known to travel along the course of the round ligament of the uterus, down through the inguinal ring.

*Softening* of the ovary is uncommon. It generally results from active inflammation, and occasionally coexists with puerperal peritonitis. Under the influence of this disease, the organ becomes tumid, infiltrated with sero-purulent matter, extremely soft, and lacerable. In some instances, the entire structure of the ovary is reduced to a dark-colored vascular pulp, in which it is impossible to perceive the slightest trace of its natural organization. In other cases, again, the organ is of a dark complexion, hard and friable, like a half-rotten pear.

2. *Heterologous Formations.*—The ovary is liable to the heteroclite formations, especially the encephaloid, the rest being comparatively infrequent.

*Tubercles* of the ovary are met with chiefly in scrofulous females, after the decline of the menses. Louis found them in one-twentieth of his phthisical subjects. The most common form in which the heteroclite deposit occurs is the miliary, but it may also exhibit itself as an infiltration.

*Melanosis* of the ovary is extremely rare, and perhaps never exists without similar disease in other organs.

*Scirrhus* is more common, though, on the whole, it is a very rare affection. The new formation may occur by itself, constituting a hard, dense mass as large as a fist or even a child's head, of an irregular globular shape, of a whitish, grayish, or drab-colored aspect, and intersected by a great number of membranous filaments. The disease is most liable to show itself about the decline of the menses, and occasionally coexists with other morbid growths.

The most common of the heterologous formations of this body is the *encephaloid*, which sometimes runs its course with frightful rapidity. It may occur at any period of life, soon after the appearance of the menses, and it seems, in some instances, to be called into activity by the process of impregnation. Generally the brain-like matter, which distinguishes this disease, is found in small, irregular masses, inclosed in distinct cysts, of a fibrous texture. These masses sometimes attain a very great magnitude. They are usually of different shades of color, being of a pale olive, brownish, or mahogany in some places, white, cream-like, or grayish in others. Branches of vessels may often be traced, in great numbers, into their structure; and not unfrequently they contain large cysts, filled with serum, pus, or sanious fluid.

*Colloid* of the ovary may occur alone, or it may coexist with other morbid products, particularly the fibrous and encephaloid; it is capable of attaining a large bulk, and exhibits the same structure as in other parts of the body.

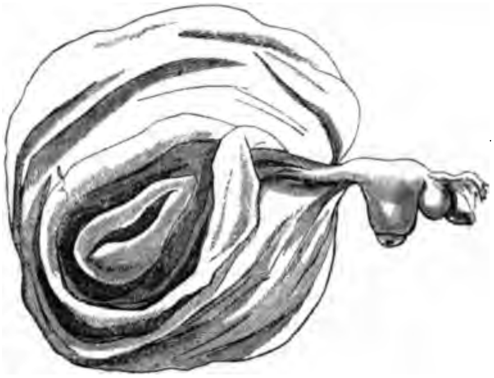
3. *Fibrous Tumors.*—Fibrous tumors, similar in their texture to those of the uterus, are liable to form in the ovary. Varying in size between a hazel-nut and an orange, they are of a grayish color, firm consistence, and usually attached by a long, narrow footstalk. Occasionally these tumors coexist with scirrhus, encephaloid, or serous cysts; and it is not uncommon to find in them small, irregular cavities, filled with a thick, dirty-looking fluid. Sometimes they are interspersed with cartilaginous, osseous, or earthy concretions. These formations are particularly liable to occur in cases of long standing, where the fibrous substance is occasionally almost wholly replaced by them. Under such circumstances, indeed, large quantities of earthy matter may be deposited, weighing many pounds, of a whitish or pale yellowish aspect, and so hard as to be divisible only with the saw.

The transformation is not always confined to the proper substance of the ovary, but may extend to its fibrous envelop, supplanting every vestige of the normal structure.

4. *Serous Cysts.*—There are probably no organs in the human body in which serous cysts are more frequently developed than in the ovaries. Assuming every variety of shape, they are most generally globular, ovoidal, or pyriform, and vary in size from the smallest nut to the magnitude of a large melon. Sometimes the whole ovary is converted into one enormous sac; at other times the cysts seem to be gregarious, or united into clusters, having no communication with each other. Occasionally the sac is multilocular, or divided into distinct compartments.

The annexed cut (Fig. 324) represents an ovarian cyst of large size. The uterus is seen to retain its natural form and volume. Attached to its left horn, at the origin of the Fallopian tube, is a small globular cyst, adherent by a short slender pedicle, and entirely unconnected with the ovary on that side.

Fig. 324.



Ovarian cyst. From a preparation in my cabinet.

The contents of these cysts vary in color and consistence in different cases. In some, the fluid is thin, pale, and ropy ; in others, thick, and dark-colored, like coffee-grounds; in others, purulent, sero-purulent, sanious, meliceric, saponaceous, tar-like, greasy, or suety.

The chemical constitution of the watery contents of these tumors varies in different cases, and even in different portions of the same sac, especially when it is of a multilocular nature. In general, it consists mainly of water, in combination with albumen and the earthy salts, along with a trace of fatty matter.

In the multilocular form of ovarian dropsy it often happens that each cyst is filled with a peculiar product, aqueous or gelatinous, sanguineous, fatty, or even chalky. These substances are liable to become decomposed, when they exhale a putrid odor, and give rise to different kinds of gases.

The brownish, turbid, or coffee-grounds-looking fluid, contained in certain ovarian cysts, probably derives its color from the admixture of blood, poured out by the vessels which are distributed through the parietes of the main sac, or the internal septiform processes, and probably undergoing a species of decomposition by long sojourn in the tumor. Fontenelle ascertained that it is composed chiefly of albumen, with some fibrin, a concrete jelly, and earthy salts. In a woman, thirty-five years of age, whom I tapped twelve years ago, the fluid, amounting to between four and five gallons, was of the color and consistence of thin molasses.

Ovarian cysts, especially the simple variety, are sometimes nearly entirely occupied by a yellow, granular substance, not unlike butter. The quantity varies from a few ounces to several pounds. This matter has been analyzed by Dr. Bird,[1] of London, who finds 100 parts to contain the following ingredients:—

| | |
|---|---|
| Butyrine, with butyric acid | 27· |
| Elaine, with traces of margarine | 38· |
| Margarine | 24· |
| Fibrous mass | 2·5 |
| Water | 8·5 |
| | 100 |

The quantity of fluid varies from a few ounces to many quarts. The largest quantity I have ever drawn off at one time was nine gallons and three-quarters. In a case reported by Dr. Hintze, of Baltimore, the cyst contained upwards of twenty-three gallons. It was nearly spherical in its shape, communicated with the urinary bladder and inferior portion of the colon, and was of a thick, compact, fibrous structure. Mead tapped a patient sixty-seven times in five years and a half, evacuating altogether two hundred and forty gallons of fluid. In the celebrated case of Martineau, paracentesis was performed eighty times in twenty-five years, and the entire quantity of water removed was eight hundred and twenty-eight gallons, three quarts, and one pint. The largest amount of fluid lost at one operation was fifty-four quarts. Thirty-nine quarts were evacuated after death, which occurred three weeks after the last tapping. The whole of this enormous quantity of water was secreted by the left ovary, which was expanded into one vast sac, extensively ossified, and not very thick.

Thus an ovary which, in the normal state, scarcely weighs two drachms, will expand, under disease, to a magnitude capable of holding an immense amount of fluid. Externally, the sac is commonly smooth and polished; internally, it is rough and irregular, frequently sending off little septiform processes. In some instances it has a dense, cartilaginous feel; and occasionally it has been found partially ossified. These sacs, it may now be observed, constitute what is termed *encysted dropsy* of the ovary, and there is reason to believe that they often, if not generally, arise from a diseased state of the Graafian vesicles.

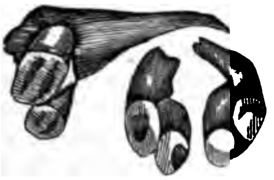
The causes of ovarian dropsy are not understood. The disease is most common in married females, but is occasionally observed in old maids, and in young girls soon after the age of puberty. Its progress is usually tardy.

---

[1] London Lancet, for 1842–3, p. 30, N. York edition.

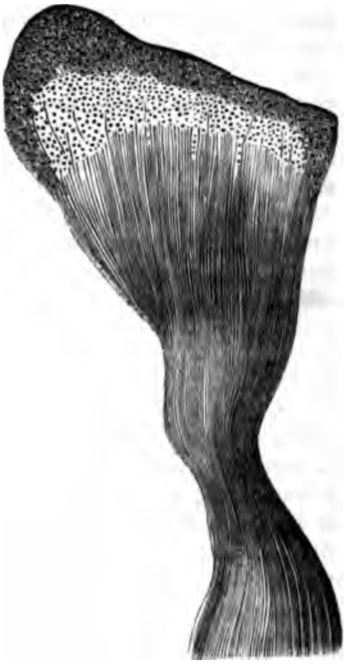
Finally, ovarian tumors have been known to contain teeth (Fig. 325), bones, cartilages, and hairs (Fig. 326), either inclosed in distinct cysts, or wrapped up in a peculiar saponaceous, fatty, or suety substance. The hairs are sometimes furnished with well-formed bulbs, and, like those of the head, to which they bear the greatest resemblance in other respects, they exhibit every variety of color. These different products, which have occasionally been observed at a very early age, are doubtless always the result of conception, the embryo being developed in the ovary instead of the uterus. When they occur in the young, immature female, without conception, their presence can be accounted for only by the theory of monstrosity by inclusion.

Fig. 325.



Teeth and pieces of jaw-bone.

Fig. 326.



Hair from an ovarian tumor.

5. *Hydatids.*—Hydatids are occasionally found in the ovaries. They vary in number from ten or a dozen to several hundred, and in volume between a pea and a hen's egg. Some adhere to the inner surface of the sac by narrow, slender necks; others are loose, and float about in the effused fluid, the quantity of which is often very great. They are generally, if not invariably, of the acephalocystic kind.

6. *Atrophy.*—Atrophy of the ovary is frequently observed in old females, after the cessation of the menses. The period for the exercise of the reproductive function being passed, the organ is no longer needed, and it accordingly, in many cases, greatly decreases in volume; the interior structure is dry, dense, and almost crisp, and the serous and fibrous envelops are remarkably rough and puckered. Similar phenomena are sometimes witnessed in women who are habitually barren.

One of the ovaries is sometimes wanting, in which case the other is almost always considerably enlarged. I have met with several instances of this kind. Occasionally both organs remain in a rudimentary state, being scarcely as large as a bean, and of a dense, fibro-cartilaginous consistence. In such cases, of which a number have fallen under my observation, there is frequently an entire absence of the vesicles of De Graaf.

7. *Hemorrhage.*—The ovary is sometimes, though rarely, the seat of hemorrhage. This may occur in three distinct situations: 1, in the parenchymatous structure; 2, in the ovules of De Graaf; 3, immediately beneath the fibrous envelop. The blood is generally collected into irregularly rounded masses, varying from the size of a currant to that of a garden pea. It is either of a dark red color or almost black; coagulated, or partly fluid and partly solid. Ovarian hemorrhage is most common in young plethoric females, and usually occurs in combination with a highly congested state of the uterus, the Fallopian tubes, and broad ligaments.

8. *Luteal Bodies.*—In the ovaries of a woman who has recently been pregnant, we may observe, in addition to the ovules of De Graaf, a tender, friable, vascular structure, generally of an oval shape, but sometimes circular, somewhat convex on its surface, like the crystalline lens, and, when fully developed, from four to six lines long, from three to four lines broad, and from one and a half to two lines and a half thick. This is called the *luteal body*, corpus luteum, or yellow body. Its color varies, however, according to the period at which it is examined. When quite young it is more or less red; by degrees, it assumes a dull yellowish aspect; after parturition, and sometimes even before, it becomes gradually more and more pale, and at length it loses its characteristic hue altogether. Its yellow color depends upon the presence of oil.

The structure of the luteal body is found, when examined with a magnifying glass, to be convoluted, like that of the human brain, or glandular, like a section of the human kidney. It has a distinct, plicated wall. It is originally quite vascular, being surrounded by a large plexus of arteries and veins, branches of which penetrate it in every direction, and can be easily filled with injecting matter. As it grows older, however, its vessels gradually shrink, its structure becomes more dense and firm, and, in time, it entirely disappears.

The manner in which this body is formed admits of easy explanation. In the first place, there is a rupture of one of the larger vesicles of De Graaf, which are always situated superficially, and frequently from two to three lines in diameter. This rupture, being effected under sexual stimulus, is followed by an escape of the contents of the cyst, leaving thus a cavity which is immediately, or almost immediately, filled up with blood and lymph. This matter gradually acquires solidity, and, receiving vessels from the surrounding parts, soon becomes an organized structure, capable, for awhile, of withstanding the action of the absorbents of the ovary. Ultimately, however, as already stated, it yields to their influence, and entirely disappears, the process of decay beginning a short time prior to the close of pregnancy. At what period it completely vanishes is still a mooted question; but it may be stated, as a general rule, to be from the fifth to the seventh month.

The cicatrice which accompanies the formation of the luteal body differs essentially from this body itself, and owes its existence altogether to the rupture of the vesicle of De Graaf, and of the overlying serous and fibrous envelops of the ovary. As the process of repair proceeds, the ragged and tattered edges of the oval or circular hollow, left by the escape of the contents of the cyst, are gathered in by the plastic matter which now occupies their place, the two becoming in time firmly and inseparably united, so as to leave merely a linear, radiated, or stellar depression. Ultimately, indeed, the parts are often so effectually rebuilt, if I may use the expression, as to render it impossible to determine where the rupture occurred.

The body now described should not be mistaken for the corpus luteum of menstruation, or ordinary sexual excitement. The discrimination is of the highest importance in a juridical point of view, observation having verified the fact that the former of these structures is always the result of pregnancy, whereas the latter sustains no such relations. The points of distinction have been well traced by Professor Dalton, of New York, in his admirable "Prize Essay on the Corpus Luteum of Menstruation and Pregnancy," published in the fourth volume of the *Transactions of the American Medical Association.* I shall give his conclusions in his own language:—

"The corpus luteum of pregnancy, then, differs from that which is merely the result of menstruation in several important particulars.

"I. It arrives more slowly at its maximum of development, and afterward remains for a long time as a very noticeable tumor, instead of undergoing a process of rapid atrophy.

"II. It retains a globular, or only slightly flattened form, and gives to the touch a sense of considerable resistance and solidity.

"III. Internally, it has an appearance of advanced organization, which is wanting in the corpus luteum of menstruation.

"IV. Its convoluted wall, particularly, attains a greater development, this portion measuring sometimes so much as three-sixteenths to one-fourth of an inch in thickness, while in the corpus luteum of menstruation it never exceeds one-eighth, and is almost always less than that. This difference in the thickness of the convoluted wall is one of the most important points of distinction. It will be much more striking when viewed *relatively to the size of the central coagulum.*

"V. The color is not, by any means, so decided a yellow, but a more dusky and indefinite hue.

"VI. If the period of pregnancy is at all advanced, it is not found, like the corpus luteum of menstruation, in company with unruptured vesicles in active process of development."

The annexed cuts, taken from Professor Dalton's paper, convey a correct idea of the appearances of these two bodies. Fig. 327 exhibits the corpus luteum of menstruation about two weeks old; and Fig. 328, the corpus luteum of pregnancy at the end of the ninth month.

Finally, it should be observed that the accompanying cicatrice, like the yellow body itself, is gradually effaced, generally within the first year after delivery, sometimes, indeed, several months sooner, but at other times, not until considerably later. Taken by itself, it affords no evidence of previous conception, inasmuch as it is impossible to distinguish it from a cicatrice produced by the discharge of an abscess, a tubercular excavation, or a sanguineous effusion. The opinion, therefore, that the scars remain for life, and exactly indicate the number of births, is erroneous.

Fig. 327.

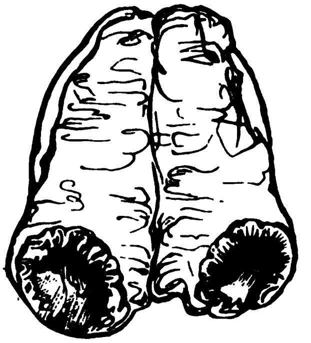
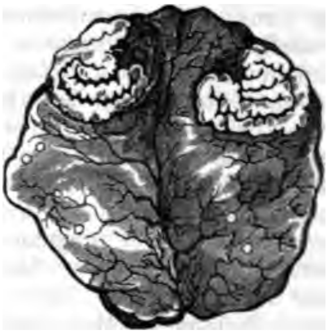


Fig. 328.



9. *Graafian Vesicles.*—The Graafian vesicles are liable to morbid alterations. The fluid which they contain is often red, brownish, or even black, from the admixture probably of blood. Occasionally they are filled with purulent matter; they have been found perfectly dry and empty; they are sometimes absent as a congenital defect; and instances occur in which they are converted into cartilage and even bone.

---

## SECTION III.

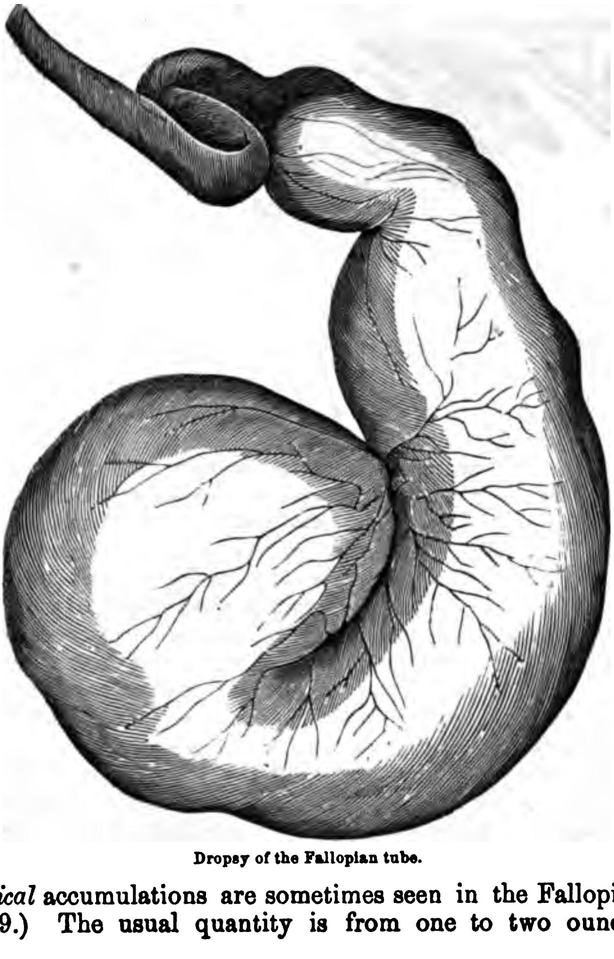
### FALLOPIAN TUBES.

The Fallopian tubes are liable to attacks of acute and chronic *inflammation*, both in the virgin and in the gravid state. These diseases may be propagated to them from the uterus, or they may have an independent origin; they may be limited to one tube, or even to a part of that tube, or they may involve both ducts simultaneously. Inflammation is most apt to be present in dysmenorrhœa and puerperal peritonitis, when the tubes are extremely vascular, and of a deep red color; and, in severe cases, they are closed up, either partially or entirely, with coagulating lymph, or distended with purulent matter. In a case mentioned to me by the late Professor Harrison, of Cincinnati, the left tube contained at least an ounce of thick, laudable pus, the right about three drachms; the mouth of the uterus was red and tumid, and the whole of its inner surface bathed with purulent matter. When the accumulation is very great, the tube occasionally bursts, and the matter escapes into the pelvic cavity; at other times, it discharges its contents through the rectum, the small intestines, the urinary bladder, or the uterus.

In some instances, these tubes terminate in a cul-de-sac; and cases are witnessed in which their fringes are destroyed by ulceration, or by adhesion to the ovaries and other organs. Their canals are also sometimes obstructed by inspissated mucus, lymph, and scrofulous matter. In a young girl of ill-fame, whose case was communicated to me by Professor Harrison, the Fallopian tubes were very greatly dilated, and contained a thick, cheese-like deposit; to the outer surface of each were appended two small tumors, filled with a similar substance.

Fibrous *tumors* sometimes grow from, sometimes within, the Fallopian tubes. They are usually of a rounded shape, very hard, and of the same appearance as fibrous tumors of the womb. Malignant disease occasionally invades these passages, commencing in them either as an original affection, or extending to them from the uterus or ovaries. The true hydatid has never, I believe, been found here; but very often small cysts, filled with a thin, limpid fluid, are seen hanging from the fimbriated extremities of these tubes, and that sometimes in women who have never borne children. Their size varies from that of a currant to that of a walnut, an orange, or even a small gourd.

Fig. 329.

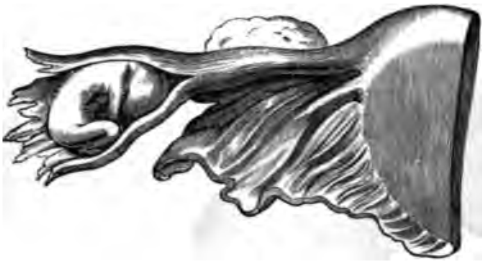


Dropsy of the Fallopian tube.

*Dropsical* accumulations are sometimes seen in the Fallopian tube. (Fig. 329.) The usual quantity is from one to two ounces; but occasionally it amounts to many pints. In such cases, the tube commonly assumes a pyriform shape, and greatly augments in thickness; a condition absolutely necessary to prevent its rupture. De Haen relates an instance in which the tube, weighing seven pounds, contained nearly four gallons of fluid; and a still more extraordinary one has been detailed by Madame Boivin.

When the ovum is retained in the Fallopian tube, as occasionally happens, it generally grows until the third, fourth, or fifth month of gestation, and then makes its escape. In some instances, the escape is preceded by ulceration; but more commonly there is a rupture of the tube, its attenuated walls being incapable of further distension. Fatal hemorrhage almost always follows this accident. A very instructive case of this species of pregnancy was communicated to me some years ago by my friend, Dr. Kennedy, of Easton, Pennsylvania. In this case, the tube was ruptured in consequence of a blow on the abdomen, and the woman gradually sunk under the hemorrhage, having been pregnant about seven months. The annexed sketch (Fig. 330) represents the fœtus as occupying the tube.

Fig. 330.



---

## SECTION IV.

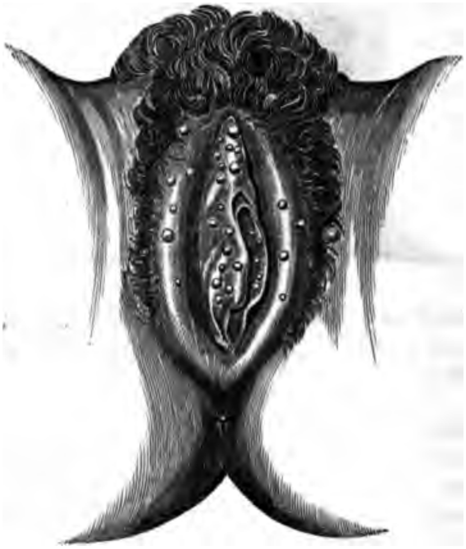
### VAGINA, VULVA, AND URETHRA.

I. *Vagina.*—The vagina is liable to ordinary and specific *inflammation.* The disease is marked by the usual anatomical characters, and is often attended with profuse discharges of purulent matter, of a very acrid nature, and mixed at times with blood. In bad cases, abscesses are formed in the submucous cellular texture; and instances are witnessed where the parts are rapidly destroyed by gangrene. A coating of adventitious membrane is sometimes observed, especially when the inflammation is connected with disease of the mouth and neck of the uterus. Ulcers of the vagina are generally referable to the syphilitic, cancerous, or scrofulous poison, and do not differ from the same class of sores in other regions of the body.

There is a form of inflammation of the vulva, which, occurring at different periods of life, but especially in married females, has its principal seat in the *mucous crypts.* The disease usually shows itself in small patches, of a red, almost scarlet complexion, studded with minute points, which are slightly elevated above the surrounding level, and perfectly distinct from each other. As it progresses, the points increase in volume, and ultimately coalesce, so as to impart to the surface a rough, granulated appearance. At this stage, and, indeed, often before the morbid action has reached this point, some of the glands become ulcerated, the sore looking, at first, like a mere speck, but gradually growing larger and larger until it has acquired the size of a split currant or small pea, its edges being steep, ragged, and, perhaps, partially undermined. The affection is, in every respect, analogous to follicular ulceration of the bowel.

These crypts are liable to chronic inflammation, attended with hypertrophy. When thus affected, they present the appearance of little vesicles, charged with a thick mucous fluid, not unlike the white of eggs, or the contents of the enlarged follicles which we sometimes see upon the lips of the uterus. These appearances are well illustrated in the accompanying cut (Fig. 331) from M. Huguier, who has published an excellent account of the disease in the fifteenth volume of the *Mém. de l'Acad. de Chirurgie.*

Fig. 331.

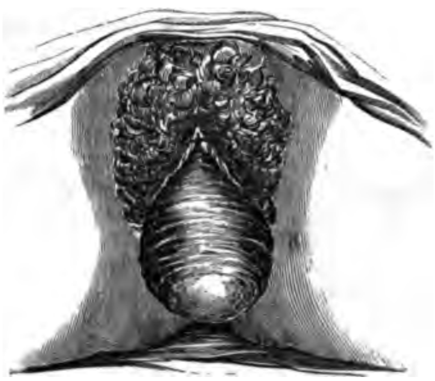


A *cystic* tumor is sometimes observed in this tube, consisting in a morbid enlargement of one of the mucous follicles. I once saw a swelling of this kind immediately beneath the orifice of the urethra of a young lady, the mother of four children. It was of a spherical shape, about the size of a walnut, and of a white, glossy appearance, with a rough, corrugated surface. It had been there for eight years. I opened the tumor with a lancet, and let out a considerable quantity of a viscid, glairy fluid, like the white of eggs. The fluid never reaccumulated.

*Polypes* are occasionally, though rarely, developed in the walls of the vagina. Tumors of this description may attain a very considerable magnitude, so as not only to distend the whole tube, but project some distance down the thighs. Their weight has been known to exceed ten pounds.

The vagina is sometimes covered with *varicose veins*, seated chiefly in the submucous cellular substance. They are spread out in an irregularly arborescent manner, and may be many times the natural size. The coats of the vessels may be entirely healthy, but more frequently they are diseased, being attenuated at one point, and thickened at another. In some cases the lining membrane becomes inflamed, causing coagulation of the blood, and the formation of pus. During parturition the enlarged veins have been known to be ruptured by the pressure of the child's head, inducing copious hemorrhage.

Fig. 332.



*Prolapse* of the vagina is most common after middle age, in married females who have borne children, and who have long suffered under a relaxed condition of the genito-urinary apparatus. The disorder may be limited to the anterior or posterior wall of the tube, or it may embrace its entire circumference. In the latter case, the vagina forms a large tumor, soft, elastic, and of a red, bluish, or lead color, passing beyond the vulva, and hanging down between the thighs, as in the annexed sketch (Fig. 332). In prolapse of the anterior wall, there is generally a descent of the bladder, which exhibits itself as a globular or ovoidal swelling at the upper part of the vulva, and which may be greatly reduced in size, if not entirely effaced, by catheterism.

*Occlusion* of the vagina is liable to occur from inflammation, and the consequent effusion of fibrin into the submucous cellular tissue. In this way, not only the orifice, but the greater part of the tube, may be much diminished in size, either uniformly, or, as more frequently happens, at particular points. The stricture, though generally partial, occasionally completely encircles the vagina, presenting an appearance as if it had been surrounded by a ligature. The affected part feels firm, thick, and rigid, not unlike the mouth of the uterus, for which it has sometimes been mistaken during labor. The obstruction may be seated at any part of the length of the tube, but in most cases it is found within the first two inches of the lower outlet. The orifice of the vagina may also be closed up by an imperforate hymen, or by a dense, pale, gristly substance.

The vagina is sometimes very *short*, not exceeding a few lines, half an inch, or an inch. When the defect is associated with absence of the urethra, the tube terminates in a cul-de-sac.

Occasionally, the vagina is *absent*, greatly contracted, or converted into a solid, gristly mass; and cases have been noticed where, through accident or congenital deficiency, it communicated with the bladder and the rectum, at various distances from the anus. Sometimes, again, the rectum opens into the vagina, and the vagina into the bladder.

The vagina may be *double*. The septum sometimes extends the whole length of the tube, dividing it into two cylindrical canals, each of which may terminate inferiorly by a separate aperture. Callisen refers to two cases where the canals thus formed were closed each by a perfect hymen. In some instances, which, however, are extremely rare, the frænum is situated transversely, constituting a sort of diaphragm, which prevents the flow of the menstrual fluid.

II. *Vulva.*—The great lips are liable to *hemorrhagic* infiltration from a rupture of some of the neighboring vessels, during or immediately after delivery. The lesion usually involves only one of these organs. The tumor which is thus formed is generally of an irregularly oblong shape, with a dark livid surface, more or less compressible, and about the size of a hen's egg. Occasionally, however, it is much larger, equalling the volume of a fœtal head, and containing from ten to twenty ounces of blood. The effusion commonly takes place suddenly, or in a very short time, and, when copious, it almost always makes its escape spontaneously, by lacerating the superincumbent textures, or it remains, and speedily induces gangrene. In the latter case, the blood is generally of a very black color, partly fluid and partly coagulated, and emits a highly offensive odor. The infiltrated tissues are sometimes frightfully lacerated, and converted into a dark, shreddy substance, without any trace whatever of their original characters.

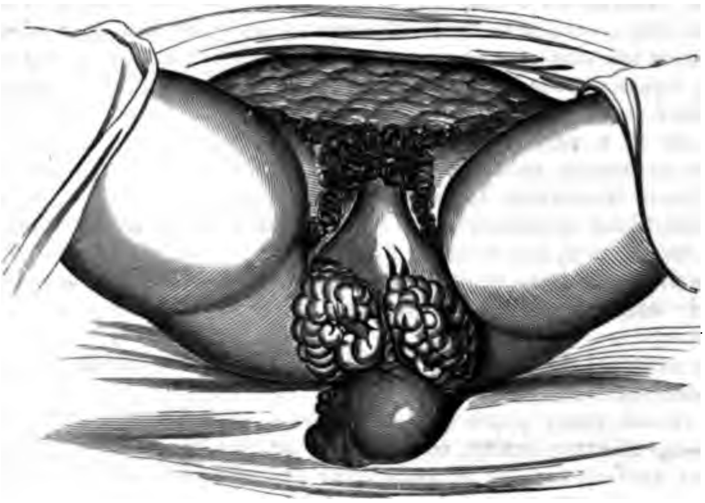
The external lip may be the seat of different kinds of *ulcers;* and they are likewise liable to gangrene, and malignant disease. Mr. Kinderwood, many years ago, described a fatal disease of the vulva of young children, which, commencing at one or more points of the mucous surface, rapidly spreads over the nymphæ, clitoris, and hymen. Gangrenous spots appear in a very short time, and continue to enlarge until the parts are converted into dark-colored, fetid sloughs. Great prostration of strength, accompanied by fever and severe pain, is the most prominent symptom of the complaint.

*Warty excrescences* are often seen within the vulva. In some instances they extend into the vagina, and down the perineum as far as the margin of the anus. Their number may be very great. In one case, that of a young girl of eighteen, I counted as many as sixty-five, of all sizes, from that of a mustard-seed to that of a raspberry. Usually they are of a pale florid color, of a fibro-cartilaginous consistence, rough on the surface, pediculated, and somewhat painful on pressure. Their origin, in most cases, is referable to gonorrhœa and syphilis.

*Polypes* of the vulva are of very infrequent occurrence. They are generally of a pyriform figure, conical, or globular, and attached by a long, narrow pedicle. In their volume they vary between an almond and a child's head, though they rarely exceed that of the fist. Occasionally they are so large as to hang down between the knees. At an early period they are of a spongy consistence and of a bright florid color; but they are liable to become hard, and to assume a pale, mottled appearance, especially when they project beyond the vulva. Ulceration occasionally occurs, followed often by a copious discharge of bloody, fetid matter. Their structure is usually of a soft, fleshy nature, either uniformly, or interspersed with serous cysts, or masses of fibro-cartilage occasionally containing medullary matter.

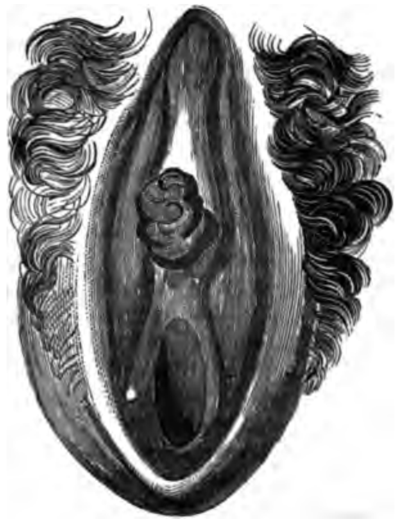
The *clitoris* and nymphæ are sometimes hypertrophied to such a degree as to require excision. In some countries these structures are naturally much larger than in America and Europe. In Persia and Turkey their development is often very great. The annexed cut (Fig. 333) from Churchill, affords a good idea of this affection.

Fig. 333.



III. *Urethra.*—The female urethra is rarely diseased. The principal lesions to which it is liable are, stricture, dilatation, and vascular excrescences.

Fig. 334.



*Stricture* is usually situated at the extremity of the tube, and may be so great as to produce much difficulty in making water. In some congenital malformations, the orifice of the urethra opens into the vagina at some distance from the external aperture. Occasionally, as when the mouth of the vagina was closed up by a dense membrane, the urethra has been known to be so much dilated as to admit the male organ.

*Vascular excrescences* sometimes spring from the female urethra, or are seated around its orifice (Fig. 334). They are of a bright scarlet color, exquisitely sensitive under pressure, and of a soft, spongy, erectile structure, with a smooth, fissured, or granulated surface. Their shape is generally pear-like, and in size they vary from a small pea to that of a horse-bean. The disease has been observed in young girls under seventeen, but is most common in adults. Its causes are unknown.

Some years ago I assisted my friend Professor Willard Parker, now of New York, in removing a *polype* from the entrance of the urethra of a young lady of eighteen. It was of a conical shape, nearly an inch and a half in length by three-quarters of an inch in diameter, very sensitive, of a bright florid color, elastic, and compressible. On maceration for a few days it became perfectly white, and seemed to be composed essentially of soft cellulo-fibrous substance, pervaded by numerous bloodvessels.

In the female, the parts most commonly attacked with *chancre* are, the edges of the pudendal lips, the nymphæ, and the orifice of the vagina. In some instances the disease affects the perineum, the interior of the vagina, and the mouth of the uterus. The ulcers exhibit the same characters as when seated on the penis; generally, however, their number is greater, and they are apt to produce more extensive devastation.

## SECTION V.

### MAMMARY GLAND.

The mammary gland exists in the male, but only in a rudimentary state. Nevertheless, there have been instances in which it was quite large, and even secreted considerable quantities of milk. It has also been known, in a few rare cases, to be affected with carcinoma.

Occasionally there is a supernumerary mamma, situated either in front of the chest, near the axilla, on the back, or on some other part of the body. Dr. Roberts, of Marseilles, has reported a case in which, in addition to the ordinary glands, a third occupied the left groin, and served to suckle several children. Examples of quadruple mammæ have been observed by Lynceus, Faber, Champion, Shannon, Lee, and others. In Dr. Lee's case the supernumerary breast was situated near the anterior margin of the axilla, and was about one-sixth the size of the other, from which it was separated by a deep, oblique depression. The nipple was small and flat, but when gently pressed yielded a milky fluid. Only one case has been recorded of five mammæ in the human subject. In some women only one breast is developed. Supernumerary nipples, capable of furnishing milk, are by no means uncommon.

The lesions of the breast may be arranged under the following heads: inflammation, hypertrophy, atrophy, neuralgia, scirrhus, encephaloid, colloid, melanosis, tubercle, hydatids, serous cysts, fibrous transformation, apoplexy, milky accumulations, fistules, and earthy concretions.

1. *Acute Inflammation.*—Acute inflammation of the mamma occurs most commonly during lactation, being rarely observed at any other period. It usually sets in within the first fortnight after parturition, from the effects of cold, or, more commonly, from obstruction of some of the lactiferous ducts. The gland is hard, lobulated, enlarged, feeling as if it were composed of a number of separate masses. By and by, however, they become all united into one solid tumor, of great firmness, and grating under the knife, of a pale rose color, and pervaded by numerous vessels, loaded with dark blood. If the gland be divided, and the section minutely examined, it will be found to contain a large quantity of fibrin, both in the proper mammary structure and in the connecting cellular tissue, thus affording an explanation of its increased size and hardness. The lactiferous tubes are enlarged, their walls being inflamed, and their interior filled with thick inspissated milk, intermixed, perhaps, with globules or flakes of lymph.

The above changes may be considered as constituting the first stage of inflammation, which often disappears under mild treatment, or simply under the withdrawal of the milk, which distends the irritated tubes. If the disease, however, be permitted to progress, the morbid appearances become more profound. The gland enlarges in every direction, its substance is rendered more dense, firm, and vascular, the lactiferous ducts are obstructed by adhesive matter and occupied by an abundance of milk, and the surrounding cellular substance is infiltrated with inflammatory deposits.

Such, in a few words, is the condition of the gland when the disease has reached its height. Under active treatment resolution is still possible, though not probable, its tendency being now to suppuration and the formation of *abscess.* This event usually occurs within a week or ten days after the commencement of the inflammation. The matter is ordinarily deposited at a single point; but sometimes the reverse is the case, suppuration occurring simultaneously in several lobules. Be this as it may, a large portion of the gland is often involved in the disease, it being sufficiently common, when several abscesses exist, to see them communicate with each other, and to open upon the surface by a single orifice. Not unfrequently, however, especially when the disease is of long standing, or has been neglected, the skin is perforated at numerous points, giving it a riddled, sieve-like appearance.

The matter which is formed in this disease is generally of a thick, cream-like consistence, and of a whitish or pale yellowish color. When the inflammation has been very high it is apt to contain flakes of lymph and pure blood, the latter being usually in a state of coagulation. Milk is almost always a prominent ingredient. Even when it exists in so small a quantity as to be undiscoverable by the naked eye, its presence may, in general, be readily detected by the aid of the microscope. The quantity of pus varies from a few ounces to upwards of a quart, the average being from four to eight ounces. From a week to a fortnight is the time required by the abscess to work its way to the surface.

The mammary gland is astonishingly exempt from *gangrene.* Such an occurrence, indeed, is possible only in very unhealthy females, or in women who, in addition to scrofulous or syphilitic disease, have been suffering, at the time of the inflammatory seizure, under an impoverished state of the blood. A few cases are upon record where gangrene of this gland was occasioned, in middle-aged females, by the protracted use of ergot. In erysipelas and carbuncle the cellular tissue around the gland sometimes mortifies, the mamma itself generally escaping.

2. *Chronic Inflammation.*—Chronic inflammation of the mamma, although it may occur at any period of life, is most common between the ages of seventeen and thirty, during the period of the greatest functional activity of the organ. It often shows itself soon after the establishment of the menses in young girls apparently otherwise quite healthy. Invading usually only one or two lobules, it occasionally attacks the entire gland, the substance of which has a peculiar doughy feel, like that of a fatty swelling, and consists of a number of nodules, from the volume of a currant to that of a filbert; it is generally of a pale yellowish or pink hue; and its consistence ranges between fibrous tissue and fibro cartilage. The disease frequently continues for years; now indolent, now advancing a little, then halting, or even receding, and then, perhaps, again taking a new start. The breast sometimes acquires an enormous bulk, but never assumes any malignant action. The precise character of the affection is not understood.

The mamma is liable to chronic *abscess.* The disease is most common in married females, between twenty-five and forty; but I have also met with it in young girls. The matter forms either in the gland itself, or, as is, perhaps, more frequently the case, in the cellular tissue around; sometimes without any assignable cause, but usually as the result of lactation, or disease in the sternum or in a rib. External violence may also induce it.

The pus is usually deep-seated, and its formation is rarely attended with any of the ordinary symptoms of inflammation, a sense of uneasiness rather than of pain, and a feeling of distension being the most common attendants. The fluid is thinner than in the acute form of the affection, and of a color slightly bordering upon greenish; it usually contains small whitish flakes, like fragments of boiled rice, and is sometimes excessively fetid, especially when it has been long confined, or is seated near a diseased bone. It is commonly inclosed in a pyogenic membrane, similar to that which we find in chronic abscesses in other organs, and often exists in enormous quantities. The matter thus formed may remain penned up in the breast for months before it manifests any disposition to discharge itself. Gradually, however, as it approaches the surface, the skin becomes tense and glossy, and the subcutaneous veins assume a varicose and bluish appearance, contrasting strikingly with the surrounding surface.

3. *Hypertrophy and Atrophy.*—Hypertrophy of the mamma is not uncommon, nor is it, as might be supposed, confined entirely to the female sex. I have repeatedly seen both breasts of the male enlarged many times beyond their normal bulk, and not a few cases are recorded where they have freely, and for a long time, secreted milk. In women, the swelling is commonly associated with amenorrhœa; but

it sometimes occurs during pregnancy, and disappears soon after delivery. One of the most extraordinary examples of hypertrophy of the mamma, perhaps, to be found on record, occurred to Dr. S. C. Houston, in a colored girl, aged sixteen, in April, 1834. The left breast, which began to enlarge much earlier than the right, weighed twenty pounds, and measured forty-two inches around the base, forming an oviform mass, which extended from the lower part of the neck to some distance beneath the umbilicus. The other breast, which was of the same shape, was also enormously enlarged; yet, notwithstanding this, it was perfectly sound, presenting not the slightest structural lesion. Around both glands, the cellulo-adipose tissue was in a state of hypertrophy, and in neither could there be detected any trace of the nipple. The girl had menstruated, and enjoyed good health, until a few weeks before her death, which was occasioned by a contusion of the left mamma, terminating in gangrene.

Mr. Hey, in his *Practical Observations on Surgery*, alludes to several cases of a similar nature, in all of which the hypertrophy was connected with suppression of the menses; in one the breast weighed fifteen pounds, and so greatly incommoded by its bulk as to require removal. Dorsten attended a young lady in whom the enlargement was associated with the retention of the milk. Both breasts were pendulous and painful, and the left was found to weigh sixty-four pounds. No decided structural change could be detected in the gland, except the mere hypertrophy of the integrant cellular texture.

*Atrophy* of the mamma is a natural effect of old age. When the menstrual function ceases, the gland begins to diminish in volume, and the wasting gradually progresses until at length the whole organ is reduced to a soft, flabby mass, of a dirty grayish tint, in which it is often difficult to detect any of the natural structure, except the lactiferous ducts, which are seldom completely effaced. Sometimes the gland shrinks early in life, particularly in married females who do not nurse their offspring. Atrophy of this viscus occasionally results from the effects of neuralgia, and other causes, as the use of iodine and hemlock.

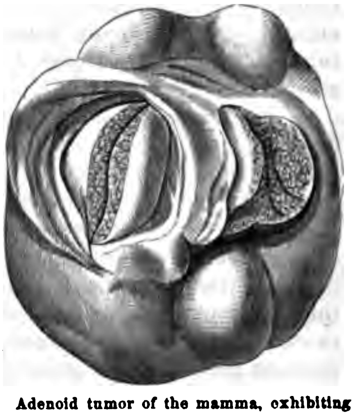
4. *Adenoid Tumor.*—The breast is liable to a species of fibrous transformation similar to that occasionally seen in the testicle. The lesion, however, is very infrequent, and is observed chiefly in young, unmarried females. The organ may retain its normal size, or it may acquire a bulk equal to that of an orange, a fist, or even an adult head. The tumor is inclosed by a thin capsule of condensed cellular tissue, is firm and compact, and has a rough, granular, nodulated surface. Occasionally, however, it is perfectly smooth, compressible, and slightly elastic; but these are characters which are not essential to it. Its intimate structure consists of a pale grayish, pink, or bluish substance, nearly or quite homogeneous, friable, easily crushed, and very similar to that of a hypertrophied lymphatic ganglion. Hence, the term adenoid, now generally applied to this form of mammary tumor. Some parts of it may be so hard as to creak under the knife, and specimens occur, possessing all the properties of old fibrinous concretions. Minute cells, variable in size and number, are occasion-

ally scattered through it. The probability is that the transformation commences in the interlobular cellular substance of the organ, and that new fibrous tissue is developed, which, by its pressure, causes at first atrophy, and finally total destruction of the primitive glandular texture. The disease is slow in its progress, and free from malignancy.

The adenoid mamma is occasionally filled with small nodules, of a rounded form, and from the size of a filbert to that of a common hickory-nut, hard, almost inelastic, movable, inclosed in cysts, and perfectly distinct from each other, the intervals between them being occupied by fibrous substance. In a specimen in my cabinet, removed in 1849, from a married but sterile female, aged thirty-three, each breast contains at least a dozen of such masses. The disease had been in progress for upwards of three years, and was attended with considerable enlargement of each gland, but there was an entire freedom from pain, lymphatic involvement, and disorder of the general health. The organs were perfectly movable, and numerous nodules could be felt in their substance in every direction. The nipples were badly developed, but not more retracted than we often see them in women who have never borne children.

Upon making, very recently, a careful examination of the little bodies above described, I found that they all consisted of a kind of cyst, inclosing a mass bearing a striking resemblance to a cauliflower, being composed of a fibrous membrane, of a white, glistening appearance, thin, and semi-transparent, folded like the ruffle of a shirt, and studded with an immense number of small delicate excrescences, looking very much like the warts which are so often met with upon the penis. They all adhered by a broad base or stem, and were made up each of a number of minute granules, resembling the eggs of certain insects. Under the microscope, Dr. Da Costa and myself found the stems to consist of fibrous tissue, while the granules were composed, for the most part, of rounded bodies, presenting a delicate fibrillated stroma, inclosing small ovoidal and spindle-shaped cells in varying proportion. The hard part of the mamma—that in which the nodules were developed—consisted of bundles of very dense fibrous tissue, wavy, and extremely distinct. Fat-cells were here and there embraced in its meshes. The adjoining cut (Fig. 335) represents, though very imperfectly, the internal structure of these nodules.

Fig. 335.



Adenoid tumor of the mamma, exhibiting its cystiform arrangement and internal structure. From a preparation in my collection.

In an interesting paper by Mr. John Birkett, in *Guy's Hospital Reports* for 1855, a tumor of a similar kind has been described by this gentleman under the name of "adenocele." He considers, however, that the peculiar bodies which I have here pointed out, consist essentially of the cæcal terminations of the lacteal ducts. He divides the disease into three great classes, each having a certain number of varieties. Further investigation is required to establish the true pathological relations of this form of tumor. In the specimen here referred to there is certainly an entire absence of tubular structure.

5. *Milk Tumor.*—The lactiferous ducts, like other excretory canals, are liable to be permanently closed by causes which interrupt the passage of the milk, such as external tumors, or accidental products contained in their interior. Of these the most common, by far, is the effusion of plastic lymph produced by inflammatory irritation. The extent to which the tube is obliterated varies in different cases, from a few lines to an inch or more. The lesion generally arises within the first month after delivery; and, as the breast is then engaged in secreting milk, the portion of the tube behind the occluded part becomes dilated, forming a globular, ovoidal, or pear-shaped tumor, the volume of which rarely exceeds that of an orange.

The swelling is usually attended with a peculiar sense of distension, and distinctly fluctuates under the finger. On cutting into it the contents are found to be of a whitish color, and of the consistence of milk, cream, or whey; the quantity ranging from a few drachms to several ounces.

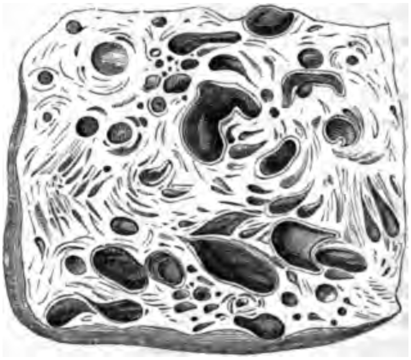
A remarkable case of this disease has been reported by Professor Willard Parker, of New York. The subject was thirty years of age, and the mother of five children, the youngest being nine months old. The swelling occupied the right breast, and was first noticed three months after her confinement. Three quarts of milk were evacuated at the first operation: in a week the fluid had reaccumulated to the amount of three pints. A still more remarkable instance is mentioned by Scarpa, of a young female, whose left breast, after her second confinement, in the course of two months, acquired such a size that it measured thirty-four inches in circumference, and rested, when she was sitting, on the corresponding thigh. The skin presented no particular alteration, except that it was rather tense and shining, the subcutaneous veins being dilated. A flow of pure milk followed the introduction of the trocar, ten pints of that fluid being drawn off in a continuous stream.

6. *Butyrous Tumor.*—A peculiar form of tumor, termed butyrous, from the resemblance of its contents to butter, was first described by M. Velpeau. It evidently belongs to the class of swellings mentioned in the preceding paragraph. It is composed, essentially, of a yellow, firm, concrete substance, of the appearance of cheese, butter, or coagulated caseum, and contained in the flattened and altered interlobular cellular tissue of the gland. Under the microscope it presents a multitude of globules analogous to those of milk, soluble, like them, in ether and alcohol, insoluble in ammonia, and interspersed with the mucous globules and granular corpuscles of the colostrum. It is not improbable that the milk in this disease is poured out into the connecting cellular tissue of the gland, either as a secretion, or as a consequence of the rupture of some of the lactiferous ducts.

7. *Hydatids.*—Hydatids seldom infest this gland. In the examination of a great number of breasts, I have not met with more than two cases. They always belong to the class of echinococci, and are most common between the ages of twenty-five and fifty. Varying in volume between a currant and an orange, they may occur in any portion of the organ, the proper substance of which they often completely destroy. They are of a globular figure, and present themselves either in clusters, or as bodies perfectly distinct from each other. When of considerable size, it is not uncommon to find within the old hydatids young ones, hanging by narrow footstalks, and having precisely a similar configuration and structure. The contained fluid is generally thin and limpid, but it may be thick and glairy, like the white of egg. In the older hydatids, especially such as are partially dead, there is sometimes an admixture of blood, pus, albumen, or curdy matter. These bodies may occur either alone, or in connection with other morbid products; and, when large and numerous, are productive of extraordinary enlargement of the breast, cases having been observed where the organ, from this cause, weighed from eight to ten pounds.

8. *Serous Cysts.*—Tumors of the breast, containing serous cysts, of a structure much more simple than that of the true hydatid, sometimes occur. The disease constitutes what is called *cystic sarcoma*, and the vesicles producing it are developed in the interlobular cellular tissue of the gland. They are of a spherical, ovoidal, or conical figure (Fig. 336), and vary in size between a hemp-seed and a marble. Sometimes they attain the volume of a hen's egg, a walnut, or an orange. Their number ranges from one to several hundred. At an early period they are smooth, transparent, elastic, vascular, closely adherent, and filled with a clear, watery fluid, slightly saline in its taste, and scarcely coagulable by heat, alcohol, or acid. Their parietes, however, are liable to become opaque and thickened, from the effects of inflammation, and the same cause generally induces remarkble changes in the contained fluid, which may be lactescent, bloody, oleaginous, glairy, or gelatinous. Different cells of the same tumor often have dissimilar contents. The morbid mass is sometimes entirely composed of cysts; at other times a considerable proportion of solid matter is interposed between them, commonly of a tough, cellulofibrous character.

Fig. 336.



Cystic disease of the breast. From a preparation in my cabinet.

The cystic tumor often acquires a large bulk. It is most common in young subjects, is tardy in its progress, and is not prone to degeneration, or reproduction after removal. When fully formed, the mammary gland is generally completely annihilated.

Cysts of large size, differing in structure from the preceding, sometimes form in the mamma. They are generally unilocular, and are composed of a single membrane which bears a very close resemblance to the peritoneum and other serous textures, its inner surface being perfectly smooth and glossy, while the outer is intimately connected to the surrounding parts by short cellulo-fibrous tissue. Occasionally the cyst is intersected by membranous septa, separating it into a number of distinct compartments, of varying size and shape. When this is the case, the cyst is said to be multilocular. Various fluids are found in these sacs. Generally they are of a serous nature, more or less viscid, coagulable, of a saline taste, and of a limpid, or pale yellowish appearance; but cases occur in which they are of a reddish, olive, brownish, claret, or blackish hue. Last winter I saw an instance in which the fluid was of the color of the tincture of iodine. Sometimes, again, it is of a lactescent nature, whey-like, or muco-albuminous. Finally, there are cases, although they are rare, in which the fluid contains cholesterine, flakes of lymph, and other substances.

Cysts of the character now described often attain a large bulk, being capable of holding from twenty to forty ounces. Their progress is always tardy, they never manifest any disposition to take on malignant disease, and they are most common between the ages of twenty-five and forty.

9. *Calcareous Concretions.*—Calcareous concretions are met with in the breast, either in its substance or in the lactiferous ducts: they are commonly small, not exceeding an ordinary pea, and are observed chiefly in connection with fibrous and other tumors. I have seen these bodies only in two instances, in females far advanced in life. They were of a whitish color, irregularly spherical in shape, and of a hard, solid consistence, like dry mortar. A case has been described by Berard, in which the outer portion of the mamma was converted into a complete osseous shell.

10. *Apoplexy.*—The breast is liable to apoplexy, consisting in an effusion of blood into the connecting cellular tissue, resembling an ecchymosis produced by a blow or leech-bite. Generally there is only one such spot, but there may be several, coming on a few days before the menstrual period, and disappearing within the first week or two after; though sometimes they continue for more than a month. The disease seems to depend upon some sympathetic action between the uterus and the breast, causing a great determination of blood to the latter, eventuating in the rupture of some of its smaller vessels. The affected parts are always of a dark, livid hue, and are exquisitely tender on pressure, the pain sometimes shooting down to the ends of the fingers.

11. *Fistules.*—During lactation a galactophorous duct is sometimes included in a wound of the breast, and, unless the edges of the integuments be very closely approximated, a lacteal fistule may remain in the part. The same consequences may be produced by a rupture of the canal from the inordinate accumulation of milk. A more common occurrence is the formation of accidental outlets, from the irritation of multilocular abscesses. These passages are often of considerable

depth, tortuous, numerous, lined by an adventitious membrane, and attended with a great deal of induration of the surrounding parts.

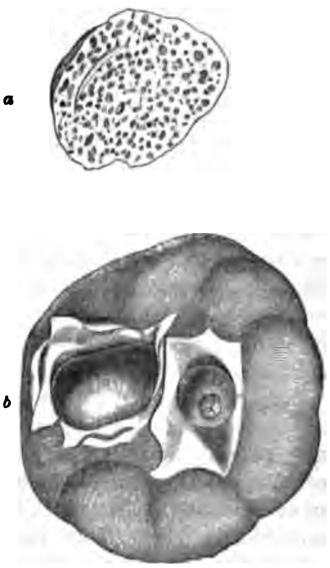
12. *Neuralgia.*—Neuralgia of the breast may occur at any period after puberty, but is most common in young females from the age of fifteen to thirty. It is characterized by exquisite pain, darting through the part like electricity, and extending generally to the corresponding shoulder and axilla, sometimes down the elbow to the fingers. The suffering resembles that of tic-douloureux, often observes a regular periodicity, is very much increased prior to menstruation, and is sometimes so severe that the patient is unable to lie upon the affected side, or bear the weight of the bedclothes. The disease, although it may last for years, has no malignant tendency, and is met with mostly in persons of a nervous, irritable temperament, with deficient menstrual secretion.

The disease is commonly confined to several of the mammary lobules, which either retain their natural bulk and appearance, or they are converted into small, solid tumors, distinctly circumscribed, movable, and highly sensitive to the touch. Occasionally these swellings seem to be seated in the connecting cellular tissue, rather than in the glandular structure; they seldom exceed the size of a marble, an almond, or a walnut; they never suppurate, and they sometimes disappear spontaneously.

13. *Heterologous Formations.*—All the heteroclite products, excepting, perhaps, the tubercular, are met with in the mamma. The most common, by far, is the scirrhous, and next in point of frequency is the encephaloid, the colloid and melanotic being extremely rare.

*Scirrhus* of the breast rarely appears before the age of thirty-five. It is most frequent about the period of the decline of the menses, and is witnessed, relatively speaking, quite as often in old maids as in women who have borne children. When inspected after death, the mamma is found to be inelastic, firm, dense, and crisp, like cartilage, which it also resembes in color: sometimes it is of a dry, fibrous texture, like the interior of an unripe pear, and of a light grayish tint, interspersed with yellowish lines, probably the remains of lactiferous ducts; more rarely the organ is soft and succulent, presenting a considerable number of small vessels, and yielding, upon pressure, a thin, opaque, serous fluid, occasionally blended with milk. These appearances frequently occur together, forming so many zones,

Fig. 337.



*a.* Section of a scirrhous nodule.

*b.* Scirrhous mamma laid open to show its lobulated structure. From a specimen in my cabinet.

gradually and insensibly running into each other. In some instances, again, the tumor contains one or more cavities, filled with purulent matter, or with a viscid, ropy fluid, not unlike the synovia of the joints.

The malady usually commences in a few lobules; but, as it progresses, the whole organ becomes converted into a firm, solid mass, with a rough, tuberculated surface. In the annexed sketch (Fig. 337), taken from a specimen in my cabinet, a large number of nodules are seen, the largest of which, hard and crisp, like cartilage, and of an oblong, spherical shape, scarcely equalled the size of a pullet's egg. Before the gland was extirpated, it had an irregular, knobby feel, and could be freely moved in different directions. When the whole of the breast is not involved, the excepted part is generally somewhat changed in its color and consistence, being yellowish, firm, and coarsely granulated, so as to resemble the substance of the pancreas.

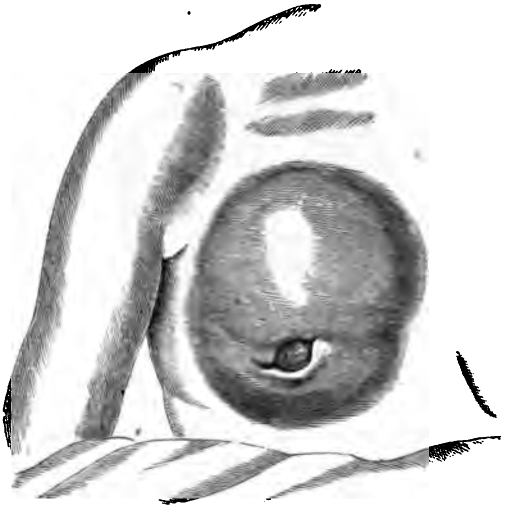
Beginning usually with slight swelling, a circumscribed lump is soon perceived, hard and irregular to the touch, and somewhat tender on pressure. The induration gradually augments; and, as the turgescence spreads, the whole gland becomes firm and knobby: in this stage, the organ is still movable, but by degrees it contracts adhesions to the pectoral muscle, so that it can no longer be pushed about with the hand. In the mean time the nipple is retracted; the skin is puckered and discolored; the superficial veins enlarge, and assume a deep bluish tinge, and presently ulceration sets in, leaving one or more circular sores, with hard, depressed, angry-looking edges, and a foul sloughy base. The discharge is thin, ichorous, offensive, and often so acrid as to corrode the healthy skin. Gradually the irritation extends to the neighboring lymphatic ganglions, which either become white, firm, and tumid, or they are rendered preternaturally soft and vascular, having often a bloodshot appearance.

The retracted appearance of the nipple is well shown in the accompanying cut (Fig. 338), from a patient at the College Clinique. It often begins early in the disease, and is produced by the manner in which the lactiferous tubes are compressed by the scirrhous matter.

Scirrhus of this gland is sometimes invaded by gangrene, even before ulceration has commenced. In a case of this kind, described in the chapter on scirrhus, the tumor was lifted completely out of its bed, the cavity being afterwards filled up with healthy granulations, though the disease returned subsequently in the neighborhood of the original affection.

Although scirrhus generally commences in the glandular structure of the mamma, yet occasionally its primitive seat is in the common integuments and in the surrounding cellulo-adipose tissue. In the former case it usually presents itself in the form of a small rounded tubercle, scarcely larger than a shot, of a bluish color, firm, superficial, movable, and free from pain. This gradually increasing, finally involves the glandular structure; the skin, meantime, becoming hard, discolored, and intimately adherent to the subjacent parts. In the other variety of the disease, a firm, oblong, or spherical lump, of considerable volume, is from the first felt deeply embedded in the adipose tissue around the organ, with which it has apparently as yet no connection. It may be readily lifted away with the thumb and finger, but it soon contracts adhesions, gradually contaminates the adjacent structures, slowly approaches the surface, and at last breaks out into a foul, irritable, fungous ulcer.

Fig. 338.

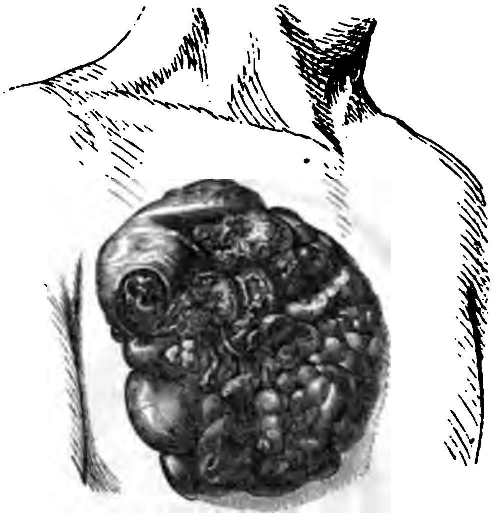


Scirrhus of the mamma, showing the characteristic retraction of the nipple. From a patient at the College Clinique.

Scirrhus of the breast sometimes remains stationary for a considerable length of time, when it rapidly assumes the characters that have just been assigned to it. When removed, it is almost sure, after an interval of several months or years, to return, either in the cicatrice, or in the contiguous lymphatic ganglions. It has been known to occur in four or five members of the same family, and occasionally it coexists with scirrhus in other parts of the body. In a few instances it has been observed in the male.

*Encephaloid* (Fig. 339) probably affects the mamma more frequently than any other organ in the body, excepting the eye, testicle, and lymphatic ganglions. Its anatomical characters here are not different from what they are in other parts of the body. The tumor is seldom very uniform in its structure, but is generally very hard in some parts; soft, spongy, and elastic in others. It not unfrequently happens that one portion is fibro-cartilaginous, another pulpy and brain-like, and a third, perhaps, hæmatoid or cystiform. Cavities or cells, containing different kinds of fluids, are often interspersed through it. Large clots of blood, sometimes of a black, brownish, or yellowish-buff color, and of varying degrees of consistence, are also sometimes

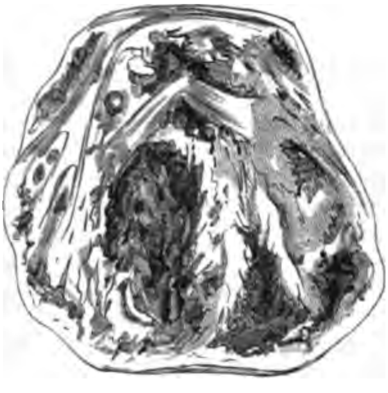
Fig. 339.



Fungus hæmatodes of the mamma; fungoid, bleeding, and blood-like.

met with. The tumor has no capsule, except what is derived from the surrounding cellular tissue, which is occasionally considerably condensed; its surface is rough and lobulated; and its substance is usually pervaded by numerous vessels, many of them of large size. Hence the frequent and exhausting hemorrhages after ulceration has commenced. The volume which the tumor attains varies, in different cases, from a fist to a man's head. The disease may occur at any period after puberty, but is most common after the thirtieth year. It sometimes coexists with encephaloid or scirrhus in other organs. Fig. 340 affords a good idea of the hæmatoid form of encephaloid of the mamma. The tumor from which the drawing was taken was removed from a negress, thirty years old, and was of very large size. The disease returned at the cicatrice, in less than three months after the operation.

Fig. 340.



Encephaloid of the mammary gland, of the hæmatoid variety. From a specimen in my collection.

*Colloid*, alveolar, or gelatiniform cancer rarely attacks the breast. The tumor advances slowly, and seldom exceeds the volume of the fist or of a fœtal head. Externally, it is of a light-grayish color, dense, firm, glistening, and irregularly lobulated; internally, it is comparatively soft and succulent, yielding some moisture on pressure, and tearing into hard, jelly-like strings. The cellular arrangement, so well marked in alveolar cancer of the stomach, is seldom very distinct in that of the breast.

*Melanosis* of the breast occurs either as an infiltration amongst the granules of the gland, or, as is most frequently the case, in the form of small spherical nodules, of a black, sooty color. Of this disease, I saw an interesting specimen, some years ago, in an old female who died of pulmonary phthisis, accompanied by scirrhus of the left mamma. The little tumors, which were five in number, were distinctly encysted, and contained a thin, ropy fluid, of the color and consistence of China ink.

*Tubercles* of the mamma are very rare, or, more properly speaking, have, perhaps, never been witnessed. The lymphatic glands around the organ are, however, occasionally thus affected, forming hard, dense nodules, similar to diseased glands of the neck.

## SECTION VI.

### PLACENTA AND UMBILICAL CORD.

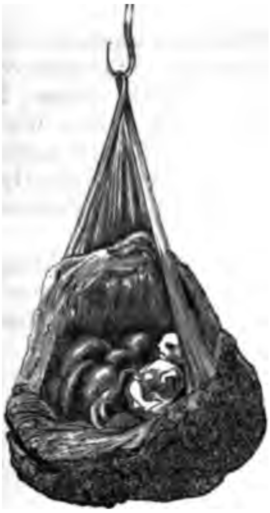
Acute *inflammation* of the placenta is extremely rare; at any rate, such must be our conclusion when we reflect upon the few cases of it that are to be found on record. The disease is generally limited in its extent, and appears to terminate in one of three ways, in the effusion of lymph, in suppuration, or, finally, in passing into the chronic form. In the first case, the affected part presents all the characters of a hepatized lung; that is, it is dense, solid, easily crushed, and of a dark reddish color. When the lymph is poured out between the inner surface of the organ and the corresponding portion of the uterus, the two structures become so intimately incorporated as to render it frequently impracticable, when the period arrives for their separation, to detach them from each other. In this way, probably, usually arises what is called morbid adhesion of the placenta.

Of *suppuration* of the placenta very little is known, except that the matter is commonly confined to one or more cotyledons, and is either diffused through their substance, or collected into little abscesses, varying in volume between that of a pea and a hazelnut. The pus is of a thick consistence, without any particular odor, and looks a good deal like softened tubercular matter.

*Softening* of the placenta is doubtless caused by inflammatory irritation, and is often associated with the fibro-cartilaginous and osseous degenerations. Occasionally the softening affects the entire organ; but, in general, it is confined to particular sections, occupying one-fourth, one-third or one-half of its extent. The volume of the placenta is seldom altered.

The most common disease of the after-birth is the *cartilaginous degeneration* (Fig. 341). This generally occurs in small, circumscribed masses, from two to four lines in thickness, of a whitish, milk-like color, and of an irregularly oval shape. In their consistence, they vary from the softness of fibrous texture to the density of articular cartilage. In some instances, they are of a pale yellowish color, and partially transformed into osseous matter. In other cases, though this is not common, the masses are intersected by fibrous bands, constituting that form of the disease to which the older anatomists have erroneously applied the term scirrhus. In a third series of cases, the affected part has a remarkably granular appearance, being composed of an infinity of small, spherical bodies, of a reddish buff color, dense and firm in their consistence, and scarcely exceeding the volume of a millet-seed. This degeneration is generally associated with atrophy, and, as might be supposed, interferes more or less with the nutrition of the fœtus.

Fig. 341.



Fibro-cartilaginous degeneration of the placenta, causing the death of the fœtus, which is *in situ*. From a preparation in my cabinet.

Another rather frequent lesion of the placenta is *ossification*. The degeneration may occur under two varieties of form. In one, the more frequent of the two, the ossification is confined exclusively to the smaller arterial branches, which assume an acicular arrangement, hundreds sometimes existing in a space not exceeding half a square inch. They are of a yellowish color, fragile, and particularly conspicuous at the uterine surface of the organ. In this way whole cotyledons are occasionally transformed. This species of degeneration, which sometimes pervades the entire placenta, is analogous to senile ossification of the arteries. The larger arterial branches usually remain sound, and the bulk of the organ is seldom materially diminished.

In the second variety, the foreign matter occurs in the form of a distinct layer, varying in thickness from the fourth of a line to a quarter of an inch. In its diameter, it rarely exceeds a cotyledon, to the inner surface of which it closely adheres, the deposition commencing apparently in its cellulo-fibrous envelop. In some instances, these plates are partly osseous, partly cartilaginous, and partly fibrous, according to the length of time they have been in progress of forming; their number is occasionally considerable; and they have been known to constitute a complete shell, accurately moulded to the uterine surface of the organ. A radiated arrangement is sometimes observable in these plates, not unlike that of the parietal bone of the fœtus, the osseous fibres extending from the centre to the circumference. The deposit consists of albumen, fibrin, phosphate of lime, phosphate of magnesia, and carbonate of lime.

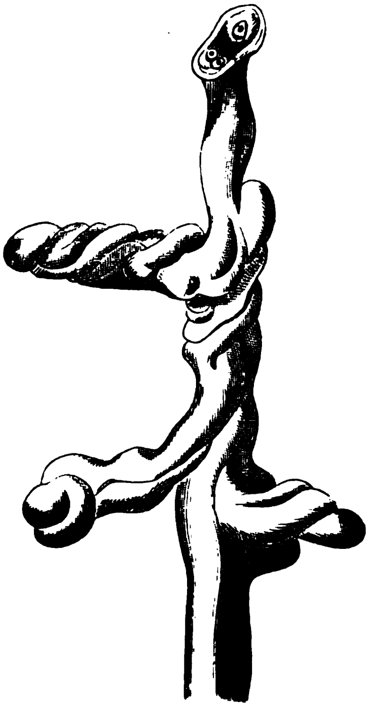
*Tubercles* of the placenta are very uncommon. In the few instances in which they have been observed they were associated with pulmonary phthisis, and presented themselves, at various parts of the organ, in the form of small discrete masses, of a pale straw color, and almost fibro-cartilaginous consistence.

The placenta is liable to the *fatty transformation.* The degenerative process probably begins in a deposit of fibrin in the cells around the villi of the chorion, which become studded with innumerable oil-globules, and intimately adherent to each other, at the same time that they lose their natural consistence, and assume a pale, brownish hue. The chorion itself is considerably altered in character, being abnormally thickened and deprived of nuclei; and the cavities of the vessels are destitute of blood and fatty matter, though this substance is generally contained in their tunics, as well as in the intervals between them.

The placenta, like other organs of the body whose existence is of a less temporary nature, is liable to *hypertrophy.* When this happens, the weight and bulk of the viscus are variously augmented, its color is abnormally pale, and the parenchymatous structure is infiltrated with serosity, pitting on pressure, and being often very firm.

Finally, the placenta is sometimes the seat of *hemorrhagic effusions.* The blood is poured into the parenchymatous substance of the organ, near its uterine surface, in the form of irregular masses, varying in volume between a pea and a walnut. The number of depôts is usually small, though occasionally every cotyledon is affected. The fluid, at first of a dark color and soft consistence, becomes gradually lighter and more dense, until finally it presents all the properties of an old apoplectic effusion of the brain. The surrounding textures are generally more or less altered, and many of the vessels are plugged up with fibrin. This lesion is occasionally connected with the fibro-cartilaginous degeneration.

Fig. 342.



Twisted and knotty umbilical cord. From a specimen in my collection.

Nearly all the lesions above described are either directly hostile to the persistence of the placenta, or they interfere, to a greater or less extent, with the nourishment of the fœtus. In the cartilaginous and osseous transformations, many of the vessels are either entirely obliterated, or their calibre is so much diminished as to admit of a very imperfect circulation. Hence, atrophy of the placenta, and emaciation of the new being, followed, when the lesions are extensive, by abortion. Ossification of the placenta occurs occasionally in several successive pregnancies.

The placenta may adhere to any part of the uterus, but is usually found at the base. In twin cases, it is either double or bilobed, and furnished with two cords. Occasionally it is attached to the head of the infant.[1]

The *umbilical cord* presents some anomalies worthy of brief notice. It is occasionally double, and cases are recorded where it was inserted into the head, chest, and extremities. The length of the cord at birth is generally about twenty inches; but it may be much longer. In one instance I found it four feet and a half, and in another, mentioned to me by Dr. Catlin, of Massachusetts, it was nearly six feet. Its veins are sometimes varicose; it is occasionally tuberculated, twisted, or knotted, as in Fig. 337; and, in a few rare instances, it has presented black nodosities, or been partially filled with serous cysts. Cases have occurred where there were two veins and but one artery, instead of one vein and two arteries.

---

[1] Nouv. Bibliothèque Méd., 1830.

# INDEX.

Abscess, 73; of brain, 342; of liver, 599; of gums, 491
Absorption, how influenced by inflammation, 46
Acephalocyst, 139; mode of reproduction, 140; of the brain, 355
Acne, 314
Adipose diathesis, 224
Adipose transformations; causes, 121; artificial; in old people, 122; effect of inflammation, 122
Adipose tissue, 223; wounds, inflammation and hypertrophy, 223; adipose tumors; cases, 225
Albinism, 333
Amaurosis, 380
Ammoniaco-magnesian calculus, 674
Analogous tissues, 70
Anasarca, 60
Aneurism, 248; sacculated, 249; cylindroid, 250; varicose, 250; dissecting, 250; spontaneous, 252; arterio-venous, 253; anastomotic, 254; termination of aneurism, 256
Anteversion of uterus, 711
Anthracion, 307
Anus, prolapse of, 577
Aponeurosis, inflammation of, 236
Apoplexy in hydatid, 142; of muscles, 234; brain, 350; lungs, 422; heart, 459; liver, 611; mamma, *see* Spleen, 626
Aqueous humor, 381
Aquo-capsulitis, 380
Arteries, wounds of, 239; arteritis, 240; suppuration, 124; gangrene, 201; ulceration, 241; gangrene, 241; softening, 242; atheromatous deposit, 246; cartilage, 244; calcareous matter, 244; hypertrophy, 247; contraction, 248
Ascites, 589
Atrophy, general or partial, 111; causes; senile atrophy, 112; of adipose tissue, 226; of muscles, 232; tendons, 235; bones, 291; hair, 336; brain, 352; spinal cord, 364; nerves, 369; thyroid body, 396; lungs, 426; heart, 459; tongue, 481; salivary glands, 483; stomach, 526; small bowels, 542; liver, 601; spleen, 623; kidney, 641; bladder, 656; testis, 692; uterus, 714; ovary, 737; mamma, 750
Auditory nerve, 390

Beard of females, 337
Bile-ducts, lesions of, 615
Bile, 617; gall-stones, 617
Biliary apparatus, 594
Blood, quantity and quality, how altered, 33; importance, 197; lesions, 198; want of coagulability from effects of lightning, disease, &c., 203; hemorrhagic diathesis, 203; causes, influence of nerves, 204; buffy coat, quantity of fibrin, 202; effects of ligature on the par vagum, 205; hematin, 207; its relative quantity in males and females, 206; in cholera, typhus, and plague, 206; serum; milky serum, 208; general diseases of blood, 211; contaminated blood, effects of, 211; increased circulation, effects of; blood in cholera, fever, 213; yellow fever, 214; chlorosis, 216; jaundice, scurvy, pulmonary phthisis, 216
Bones, 265; restorative process in, 276; fractures, 276; false joints, 278; osteitis, 279; suppuration, 280; caries, 280; necrosis, 282; exfoliation, 282; sequester, 283; regeneration, 284; softening, 285; rachitis, 286; induration, 287; fragility, 288; hypertrophy, 288; exostosis, 290; atrophy, 291; acephalocysts, 294; osteo-sanguineous disease, 294; cartilaginous tumors, 295; scirrhus and colloid, 296; encephaloid, osteo-sarcoma, 297–8; melanosis, tubercles, 298–9
Bowel, large and small. (See *Large and small bowel.*)
Brain, 335; wounds of, 338; inflammation, 339; yellow and red softening, 340; stages and progress, 340; suppuration, 341; abscess, 342; gangrene, 344; softening, its progress and termination, 344; chronic inflammation, induration, 348; ulceration, 349; apoplexy, 350; tubercles, 353; melanosis, encephaloid, 353–4; cartilaginous and calcareous deposit,

354; cysts, 355; acephalocyst, adipose tumor, 355; hypertrophy, 352; atrophy, 352
Breast, female, inflammation, acute and chronic, 748; suppuration, 748; chronic inflammation, 749; hypertrophy and atrophy, 749; fibrous transformation, 750; milk tumor, 752; butter-like tumor, 752; hydatids, cystic sarcoma, 753; calcareous concretions, 754; apoplexy, 754; fistule, 754; scirrhus, 755; neuralgia, 755; encephaloid, 757; colloid, melanosis, tubercles, 759
Bronchiæ, dilatation of, 406; obliteration, 407; ossification, 409
Bronchitis, 404; ulceration, 405
Bronchocele, 394
Bullar diseases, 322
Burses, synovial, 237; inflammation, 237; hydatids, 238; hypertrophy, 238

Calcareous matter in arteries, 244; in brain, 354
Calculi, pancreatic, 630; salivary, renal, urinary, 672
Capillaries, structure, 46; two kinds, not equally abundant in all parts, 47; condition in inflammation, 49
Carcinoma of the uterus, 720; of nerves, 368, of maxillary sinus, 477; of mouth, 478; scrotum, 695; penis, 702; stomach, 527
Carditis, acute, 454
Cartilaginous transformations, 119
Cartilages, articular, 269; loose cartilages of joints, 273
Caries of bones, 280; of teeth, 485
Cataract, 384
Caverns, tubercular, 163
Cellular texture, 218; ossification, 119; lesions, 218; acute inflammation, 218; gangrene, chronic inflammation, 220; induration, 220; morbid growths, 221; infiltration, 221; hemorrhage in, 221; emphysema, foreign substances, parasitic animals, 222
Cellular transformations, 117
Chalk-stones, 274
Charbon, 307
Chaussier, case of tubercles in fœtus, 151
Chlorosis, blood in, 216
Cholera, saline injections in, 207
Choroid coat, 379
Chordee, 699
Cicatrice, 102
Cicatrization, stages of, 102
Cirrhosis, 602
Congestion, causes of, 53
Coagulability of blood, want of, 203
Conjunctiva, 373; suppuration, 373; vesicles, 374; granulations, 374; pterygium, 375
Conjunctivitis, 373
Contaminated blood, effects of, 211
Contractility of muscles, 228
Contraction of arteries, 248
Cornea, 375; corneitis, suppuration, 375; ulceration, cicatrization, opacity, fatty degeneration, ossification, 377; fleshy excrescences, 378
Corpora lutea, 738
Crude tubercle, 157
Crusta lactea, 317
Crystalline lens, capsule of, 383; situation and structure, 383; cataract, 384
Cupped blood, 201
Cutaneous and mucous tissue, their mutual transformations, 118
Cutaneous system, 302. (See *Skin*.)
Cylindroid aneurism, 250
Cysts, simple, 144; multilocular, 145; included, 145; inflammation of, 146; of brain, 355
Cysticercus, organization and situations of, 136; five species of; cellular, vesicular, dicystic, speckled, Fischerian, 137

Diabetes mellitus, 767
Demours, membrane of, 380
Diceras, 138
Diffuse inflammation, 219
Discoloration after death, 54
Disease, what; functional or organic, 36; result of inflammation, 36; modified by age, sex, climate, 37
Dropsy, 60
Du Hamel, case of malignant pustule, 212
Dupuy on experiments on the pneumogastric nerve, 205; on transfusion, 212
Duodenum, inflammation and ulceration of, 530; perforations, 531; rupture, carcinoma, 532
Dura mater, inflammation of, 356; suppuration, fibrous tumors, 356; ossification, 357; Pacchionian glands, 357

Ear, 387; polypes, 387; tympanum, 388; Eustachian tube, labyrinth, 389; vestibule, auditory nerve, 390
Echinococcus, 138
Ecthyma, 315
Eczema, 324
Edson, Calvin, living skeleton, 226
Eiloid, 303
Elephantiasis, 326
Emphysema, of cellular texture, 222; lungs, 420: vesicular, 420; interlobular, 421
Encephaloid, 177; seat and forms, 177; color and consistence, 178; structure, 179; origin; a disease of early life, 183; progress and termination, 185; in the muscles, 232; lymphatic glands, 267; brain, 354; bones, 296; skin, 304; eye, 385; lungs, 424; pleura, 447; heart, 457; peritoneum, 592; liver, 608; kidney, 646; prostate, 682; bladder, 657; testicle, 688; uterus, 721; ovary, 734; mamma, 757
Encysted tubercle, 154

Encephalitis, 339
Endocardium, 468
Endocarditis, characters, 468; effects, 470
Ephelis, 333
Epispadias, 749
Epulis, 491
Ergot, a cause of gangrene, 92
Erysipelas, 313
Erythema, 312
Exanthems, 311
Excavations, tubercular, 162
Exfoliation, 283
Exostosis, 290
Extrophy, 659
Eye, 371; ball of, 373; conjunctivitis, 373; suppuration of conjunctiva, 373; vesicles, 374; granulations, 374; pterygium, 375; cornea, 375; corneitis, 375; sclerotica, 379; choroid, 379; retina, 380; optic nerve, 380; aquo-capsulitis, aqueous humor, 381; filaria papillosa, 381; iritis, 381; capsular cataract, 383; lens, 384; lenticular cataract, 384; vitreous humor, 385; encephaloid, 385; melanosis, 386

Fallopian tubes; inflammation, 740; watery fluids in, 741
Fatty discharges from bowels, 544
Fibrinous calculus, 675
Fibrin, chemical composition, disposition to become organized, 66; mode of organization, 67; tissues resulting from it, 70; its importance in producing union, 71; want of coagulability, 203; quantity of in health and disease, 204
Fibrous transformations, 118
Filaria medinensis, 223; papillosa, 381
Fistules. Definition, situation, extent, 114; orifices, direction, formation, nature of discharge, state of surrounding tissues, 116; causes, 116
Fistule in anus, 578
Fluids and solids, 33
Fluke in liver, 610
Follicular enteritis, 513
Foy, analysis of melanosis, 165
Fractures, mode of union, 279
Fragility of bones, 288
Frambœsia, 327
Frontal sinus, 477
Fusible calculus, 674

Gall-bladder, inflammation of, 613; ulceration, 614; dilatation, œdema, 614; suppuration, 614; rupture, atrophy, 615; ducts, lesions of, 615; bile, 617
Gall-stones, 617; symptoms, 618
Ganglia, nervous, 367; lesions, 367
Ganglions, lymphatic, 265
Ganglion of tendons, 236
Gangrene, 89; characters and seat, 89; causes, 91; senile gangrene, 94; cellular tissue, 218; bones, 282; skin, 307; brain, 344; nerves, 368; lungs, 416; heart, 455; teeth, 485; gastro-enteric mucous membrane, 514; liver, 599; spleen, 621; rare in the kidneys, 637; also in bladder, 654
Gastro-enteric mucous membrane, its organization, 500; glands of Brunner, 502; color; color in fœtus, and during digestion, 501; color, influenced by the kind of death, 502; acute inflammation, 503; redness, 504; arborescent and capilliform injection, 505; speckled appearance, 505; vascularity, 507; transparency, 508; dryness, thickness, softening, 508; vesicular eruption, 509; plastic exudations, 509; suppuration and effusion of blood, 510; rice-water secretion, 511; follicular enteritis, 513; gangrene, 514; chronic inflammation, 515; its characters, 515; softening, stages of, 518; color of, do. 519; softening, by the gastric juice, 520
Gendrin, experiments on transfusion, 211;
Generation, organs of, in male, 683; in female, 707
Gibson, Dr., remarkable case of fragility of bones, 288
Glands, lymphatic, 265; of Peyer, 533
Gleet, 699
Glossitis, 479
Goitre, 394
Graafian vesicles, 740.
Granulations, 98; structure and sensibility, 100; absorb and secrete; their importance, 101
Granulated kidney, 638
Granulated liver, 602
Gubernaculum testis, transformation, 117
Guinea worm, 223
Gums; epulis, 491; ulcerative absorption, 489; abscess, 491

Hæmophthalmus, 381
Hæmoptysis, 441
Hair, lesions of, 335; Polish plait, 335; atrophy, hypertrophy, 336; other lesions, 337
Heat of inflammation, experiments on, by Hunter, Home, and Huber, 42
Heart, situation, 453; weight and dimensions, 453; carditis, 454; suppuration and ulceration, 455; gangrene, 455; softening, 455; induration, cartilaginous and osseous transformations, 456; scirrhus, encephaloid, 457; fatty transformation, 457; apoplexy, atrophy, 459; dilatation, 462; passive aneurism, sacculated aneurism, 462; rupture, 463; tubercles and melanosis, 457; serous cysts and hydatids, 457; hypertrophy, 459
Hematosine, relative quantity in males and females, 206; is slowly reproduced when removed, 206; its condition in cholera, typhus, and plague, 206; effects of dividing the pneumogastric nerve on, 207
Hemorrhage, causes of, 82; most frequent seat, 84; different kinds of, 84; quan-

tity, 86; remarkable case of, following extraction of a tooth, 203; hereditary cases, 204; how arrested by nature, 239; from the skin, 310
Hemorrhagic diathesis, 204; causes, 204
Hemorrhoids, two varieties of, 575
Henry, Dr., on the composition of melanosis, 165
Hepatitis, 596
Hernia, varieties of, 553
Herpes, 326
Heterologous formations; classification, 147; duration and origin, 148
Horny excrescences, 305
Hughes, Dr., cases of hereditary predisposition to hemorrhage, 204
Hunter, John, experiments on heat, 42
Hydatids, seat of; met with in nearly all animals, 135; organization and classification, 135; origin, 140; how nourished, 141; mode of termination, 142; apoplexy of, 142; in muscles, 233; burses, 238; bones, 294; brain, 355; lungs, 425; liver, 608; spleen, 625; kidney, 645; testicle, 689; uterus, 725
Hypertrophy, causes, 108; general or local, 109; color, weight, and volume, 110; its nature, 110; hypertrophy of the adipose tissue, 225; muscles, 232; arteries, 247; lymphatics, 266; bones, 288; skin, 304; nails, 334; hairs, 336; brain, 352; spinal cord, 364; nerves, 369; thymus gland, 392; thyroid gland, 394; lungs, 426; heart, 459; tongue, 480; salivary glands, 483; tonsils, 493; stomach, 524; small bowels, 542; liver, 601; spleen, 623; kidney, 641; bladder, 654; prostate, 677; testis, 692; clitoris and nymphæ, 746; mamma, 749
Hypospadias, 701

Ichthyosis, 329
Impetigo, 316
Induration, 104; color and degrees of induration, 105; period necessary for its production, causes, 106; termination and results, 107; of cellular tissue, 220; muscles, 229; arteries, 244; brain, 349; spinal cord, 364; heart, 456; liver, 601; spleen, 623; kidney, 641; uterus, 714
Infiltration, tubercular, 154
Inflammation, originally local; modified by age, sex, climate, 37; acute and chronic, 38; its frequency in different organs variable, 38; common and specific, 39; its nature and symptoms, 39–46; its seat, 46; agency of the vascular and nervous systems, 49; condition of the capillaries, 49; theories of Boerhaave, Cullen, and others, 57; terminations of inflammation, 58; buffy coat of blood in, 200; cellular texture, 218; adipose tissue, 223; muscles, 228; tendons, 235; aponeuroses, 236; burses, 237; arteries, 238; veins, 257; lymphatics, 263; lymphatic glands, 265; joints, 269; synovial membrane, 272; ligaments, 275; bones, 279; periosteum, 300; dura mater, 356; arachnoid, 358; pia mater, 362; brain, 339; nerves, 368; lachrymal gland, 371; conjunctiva, 373; cornea, 375; sclerotica, 379; choroid, 379; retina, 380; iris, 381; tympanum, 388; thyroid gland, 393; larynx, 397; trachea, 403; bronchia, 404; lungs, 410; pleura, 442; pericardium, 448; heart, 454; endocardium, 468; nasal cavity, 473; maxillary sinus, 476; frontal sinus, 477; tongue, 479; salivary glands, 482; teeth, 486; tonsils, 492; pharynx, 495; œsophagus, 496; gastro-enteric mucous membrane, 503; duodenum, 530; vermiform appendage, 570; peritoneum, 585; liver, 595; gall-bladder, 613; spleen, 620; pancreas, 627; kidney, 634; bladder, 652; prostate, 676; testicle, 683; seminal vesicles, 694; penis, 698; uterus, 711; ovary, 733; Fallopian tubes, 740; vagina and vulva, 742; mamma, 748; placenta, 759
Intestinal worms; lumbricus, 580; tricocephaloid, 583; tape-worm, 584
Intussusception, 551
Inversion of uterus, 711
Iris, inflammation of, 381; prolapse of, 382; pupil, alterations of, 382
Itch; itch insect, 325

Jaundice, state of blood in, 216
Joints, 269; inflammation, softening, suppuration of cartilages, 270; ulceration, 270; ossification, 271

Keloid, 302
Kentucky giant, 224
Kidneys; congenital vices, 633; lesions of their fibrous covering, 633; acute inflammation of, 634; granular degeneration, 638; induration, 641; hypertrophy and atrophy, 641; encephaloid, 646; tubercles, melanosis, 647; serous cysts, 642; hydatids, 645; ossification and fatty degeneration, 642; laceration, 650; concretions, 648; strongyli, 649

Labyrinth of the ear, 390
Lachrymal apparatus, 371; gland, inflammation of, 371; scirrhus, serous cysts of, 372; excretory ducts, dilatation of, inflammation of, 372; lachrymal sac, 373
Lamellated transformation, 119; tubercular deposit, 154; melanosis, 167
Lambert, Daniel; hypertrophy of adipose tissue, 224
Lardaceous tissue, 172
Large bowel, ulceration of, 565; cicatrization, 566; vermiform appendage, diseases of, 570; hypertrophy of coats of the colon, 567; excrescences, 567; gene-

ral diseases of mucous membrane, 568; carcinoma, 571; organic stricture of the rectum, 573; spasmodic stricture, 574; polypes, 574; hemorrhoids, 575; varicose enlargement of veins of rectum, 577; prolapse of anus, 578; fistule, 578; malformations, 579
Larynx, inflammation, 397; œdema of glottis, 398; membranous croup, 398; ulceration of larynx, 400; osseous transformations, 401; polypes, 401; warty excrescences, tubercles, hydatids, 402; encephaloid, 402
Lens, crystalline, 383
Lenticular cataract, 384
Lentigo, 332
Lepoides, 303
Lepra, 328
Lichen, 321
Ligaments, lesions, 275; mode of reparation, inflammation, 275; atrophy, calcareous concretions, 276
Lips, encysted tumor of; hare-lip, 478
Liver, weight, color, and analysis of, 595; situation, 595; inflammation, 595: anatomical characters of, 596; suppuration, 597; gangrene, 599; softening, 600; induration, 601; hypertrophy, 601; atrophy, 601; granulated, 602; nutmeg liver, cirrhosis, 602; tubercles, 607; scirrhus, 607; encephaloid, gelatiniform sarcoma, 608; melanosis, hydatids, 608; serous cysts, 609; fatty liver, 604; parasites, 610; osseous and cartilaginous deposits, 610; erectile tumors, rupture, 611
Lombard, Dr., on relative frequency of tubercles in different organs of young subjects, 150
Louis, on site of tubercle in adults, 150
Lumbricoid worm, 580
Lungs, lesions of, 409; acute inflammation, stages of, 410; symptoms of inflammation, 410; terminations, 414; chronic inflammation, 418; œdema, 419; emphysema, 420; apoplexy, 422; encephaloid, 424; melanosis, 424; serous cysts, hydatids, 425; calcareous concretions, 425; hypertrophy, atrophy, 426; tubercles, 427; varieties of tubercular deposit, 427; cicatrization of tubercular cavities, 433; hæmoptysis, 441
Lupus, 327
Luteal bodies of the ovaries, 738
Lymph, uniformly the result of inflammation, 63; forms of, 66; chemical composition, 66; organization of, 67; tissues resulting from it; analogous tissues, 70; importance of in the union of divided parts, 70
Lymphization, 63
Lymphatics, lesions of, 263; inflammation, 263; suppuration, tubercles, ossification, dilatation, 264; aneurism, 264; obliteration of thoracic duct, 264
Lymphatic glands, 265; inflammation, 265; suppuration, gangrene, hypertrophy, 266; scirrhus, encephaloid, 267; tubercles, ossification, 268

Male organs of generation, 683
Malignant pustule, 307
Mammary gland, inflammation, acute and chronic, 748; adenoid tumor, 750; milk tumor, butyrous tumor, 752; scirrhus, 755; encephaloid, 757; hydatids, tubercles, colloid, 758; cystic sarcoma, 753; hypertrophy, atrophy, 749; calcareous concretions, 754; melanosis, 759; neuralgia, 755; apoplexy, 754; obstruction of ducts, 752
Mammary sarcoma, 753
Maxillary sinus, 476; carcinoma, exostosis, 477
Medullary membrane of bones, 301; inflammation of, 302
Melanosis, 164; found in man and lower animals; chemical analysis of, 165; color and forms, 166; most common seat, 168; causes, 169; muscles, 231; lymphatics, 267; bones, 298; periosteum, 301; skin, 304; brain, 353; eye, 386; lungs, 424; heart, 457; small bowels, 543; peritoneum, 592; liver, 608; pancreas, 630; kidney, 646; mammary gland, 752
Miliaria, 324
Miliary tubercle, 153
Milky serum, case of, 208; characters of, 208
Moles, 728
Mucous membrane, gastro-enteric, *see* gastro-enteric mucous membrane.
Mucous transformations, 118
Multilocular cyst; most frequent in the brain; is found in the ovaries, 145
Mumps, 482
Muscular system, 227; mode of union, 227; acute inflammation, suppuration, 228; gangrene, chronic inflammation, ulceration, softening, induration, 229; ossification, fibrous transformation, 230; fatty degeneration, tubercles, melanosis, scirrhus, encephaloid, colloid, 232; hypertrophy, atrophy, parasites, 233; apoplexy, 234

Nævus, 254
Nails, 334; hypertrophy, 334; onyxitis, 335
Nasal sinus, 473; inflammation, 473; ozœna, epistaxis, polypes, 474
Necrosis, 282
Nephritis, 635
Nerves, restorative power, 367; neuritis, 367; suppuration, 368; ulceration, gangrene, carcinoma, hypertrophy, tubercles, atrophy, 369; tumors, 369; enlargement of ganglia, 370
Nervous system, 338; influence of, on the blood, 207

Neuritis, 367
Nigritism, 333
Nutrition, how affected by inflammation, 46

Obesity, 224
Œdema, 60; of cellular texture, 221
Œsophagus, inflammation of, 496; ulceration, abscess, 497; softening, stricture of, 498; dilatation, 498; carcinoma, 499; laceration, 499; malformations, 499
Oil, in serum, 208
Onyxitis, 335
Optic nerves, diseases of, 380
Organs of generation in male, 683; in female, 707
Osseous transformations, 119; three varieties of; of the dura mater, 120; most common seat and mode of formation, 120
Osseous system, 276 (*see* bones)
Ossification, is it always preceded by cartilage? 119; of muscles, 230; tendons, 235; lymphatics, 263; lymphatic glands, 268; cartilages of joints, 271; periosteum, 301; dura mater, 356; of the laryngeal cartilages, 401; tracheal rings, 404; pleura, 446; heart, 456; endocardium, 469; peritoneum, 596; liver, 610; gall-bladder, 615; spleen, 625; kidney, 642; uterus, 720; placenta, 760
Osteitis, 279
Osteo-sanguineous disease, 294
Osteo-sarcoma, 298
Ovaries, weight and dimensions, 732; inflammation, 733; suppuration, softening, tubercles, melanosis, scirrhus, 734; encephaloid, colloid, fibrous tumor, 734; serous cysts, 735; hydatids, 737; teeth in, 737; atrophy, 737; hemorrhage, 738; luteal bodies, 738; their structure and mode of formation, 738
Oxalic acid calculus, 673

Palate, soft; polypes, 494; split palate, uvula, hypertrophy of uvula, 495
Pancreatic scirrhus, 172
Pancreas, diseases of, 627; softening, gangrene, chronic inflammation, 628; atrophy, hypertrophy, 628; scirrhus and encephaloid, 629; fatty degeneration, serous cysts, tubercles, melanosis, 630; laceration, calculi, 630
Papillæ of skin, 304; of tongue, their diseases, 481
Papular diseases of skin, 321
Paraphymosis, 706
Parotid, inflammation of, 482
Pellagra, 330
Pemphigus, acute and chronic, 322
Penis, acute inflammation of urethra, 698; chronic do., gleet, chordee, stricture of urethra, 699; abscess, malformations of urethra, 701; morbid erection, pectiniform septum, carcinoma, 702; chancres, 703; herpetic ulcers, 705; psoriasic ulcers, 705; phymosis and paraphymosis, 705
Pericarditis, 448; hydro-pericardium, effusion of pus, 449; effusion of blood, air in, serous cysts in, 451
Pericardium, 448
Periosteum, lesions of, 300; inflammation of, 300; ossification, melanosis, 301
Periostitis, 300
Peritoneum, acute inflammation of, 585; adhesions, 586; pus in cavity of, 586; gangrene, chronic inflammation, 587; false membranes, fistulous openings, 588; tubercles, ascites, 590; melanosis, scirrhus, and encephaloid, 592
Peyer's glands, 533
Pharynx, inflammation of, 495; abscess of, sacculated, 496
Phlebolites, 260
Phlegmonous inflammation, 219; erysipelas, 313
Phosphatic calculus, 674
Phthisis, 427; miliary tubercle, 428; gray granulation, 427; stratiform, 428; caverns and excavations, 429; cicatrization, 433; sex, influence of, 435; age, 436; duration of phthisis, 436; is it contagious? 436; disease of pleura in phthisis of air-passages, heart, 437; spleen and liver, 438; stomach and intestines, 439; anal fistule an infrequent attendant on phthisis, 440; disease of lymphatics, brain, 440; nature of phthisis, 440; hæmoptysis, 441
Phymosis, 705
Pityriasis, 328
Pia mater, inflammation of, tubercles, ossification, cysts in, 362
Piles, two varieties of, 575
Placenta, inflammation of, 759; softening, suppuration, cartilaginous degeneration, ossification, 760; fatty transformation, 761; hypertrophy and sanguineous effusions, 761
Pleura, 442; acute inflammation of, 442; gangrene, 443; concretions, formation of gas, 445; ulceration, ossification, tubercles, scirrhus, encephaloid, 447; chronic inflammation, 444
Pleurisy, 442 (*see* pleura)
Plica polonica, 335
Pneumatosis, history, frequency, names by which it is known, form, 122; extent, physical and chemical properties, causes, 123; effects on neighboring organs, most frequent in females, 126; duration, 127; termination, 127
Poisons, acrid, effects of on the gastroenteric mucous membrane, 506
Pneumonia, acute, 410; stages of, 410; terminations, 414; gangrene, resulting from, 416; chronic pneumonia, 418

Polycephalus, characters and situation of, 137
Polypes, situation, not peculiar to human subjects, number, 128; size, form, structure, varieties, 129; degeneration, 131; period of life, sex, effects, 132; true character, 133; of the ear, 387; larynx, 401; nasal cavity, 474; maxillary sinus, 477; pharynx, 496; uterus, 717; vagina, 743
Porrigo, 316
Prolapse of rectum, 578; uterus, 711
Prostate gland, 676; acute inflammation of, ulcerations, chronic inflammation, hypertrophy, 677; atrophy, fibrous tumors, 681; tubercles, calculi of, 682; phlebolites, 682
Prurigo, 322
Psoriasis, 329
Pterygium, 375
Pupil, lesions of, 382
Pulmonary apoplexy, 422
Punctiform melanosis, 167
Pus, 77; healthy, 80; scrofulous, sanious, fibrinous, contagious, muco-purulent, 80; characters and mode of production, 81
Pustular diseases of skin, 314 (*see* skin)
Pustule, malignant, 307
Pyelitis, 633

Redness as a symptom of inflammation, 41
Regeneration of bones, 284
Rectum, organic stricture of, 573; spasmodic stricture, 574
Red particles of blood, their physical and physiological characters, 198
Respiratory apparatus, 397
Retina, 380
Retroversion of the uterus, 710
Rives, tubercles in an infant, case of, 151
Roseola, 312
Rubeola, 312
Rupia, 323
Saline injections in cholera, 207
Salivary glands, inflammation of, 482; suppuration, gangrene, 483; atrophy, hypertrophy, scirrhus, fatty degeneration, salivary calculi, ranula, 484
Salts of blood, abstraction of, 207
Sanguineous liquor, 199
Scabies, 325
Scaly diseases of skin, 327
Scaly tetter, 329
Scarlatina, 313
Scirrhus, 170; varieties of; tuberoid, infiltrated, stratiform, 171; mammary, pancreatic, lardaceous, 172; reticular carcinoma, 172; chemical composition, 173; influence of age and sex, 173; most common situation, 174; causes, 175; changes, 176; muscles, 232; bones, 297; lachrymal gland, 372; thymus gland, 393; thyroid gland, 396; heart, 457; parotid, 483; œsophagus, 499; pylorus, 529; peritoneum, 591; liver, 607; kidney, 646; prostate gland, 682; testicle, 688; womb, 720; ovary, 734; breast, 755
Sclerotica, diseases of, 379
Scrotum, cancer of, sarcomatous enlargement, 695; sloughing, concretions in, 698
Scurvy, 216
Sebaceous follicles, diseases of, 309
Seminal vesicles, diseases of, 694
Sequester, 283
Serous cysts, 143; seat and structure, 143; multilocular, 145; included cysts, 145; in brain, 355; lachrymal gland, 372; lungs, 425; pericardium, 451; spleen, 625; pancreas, 630; kidney, 642; ovary, 735
Serum, effusion, 59; color, consistence, and chemical composition, 60; causes, 61; serum of the blood, 208; milky serum, 208; causes of, 208; serum in inflammation and other diseases, 209
Sheaths of tendons, 236
Skin, 302; unclassifiable lesions of, 302; keloid, 302; eiloid, lepoid, 303; melanosis, 304; encephaloid, scirrhous tumors, 304; hypertrophy, 304; corns, 305; verruca, horns, 305; gangrene, 307; malignant pustule, 307; white gangrene, sebaceous follicles, diseases of, 309; inflammation, 309; hemorrhage, 310; classifiable lesions, exanthems, 311; roseola, urticaria, erythema, 312; rubeola, 312; scarlatina, 313; erysipelas, 313; pustular diseases, acne, 314; sycosis, 315; ecthyma, impetigo, 316: porrigo, 316; crusta lactea, 317; vaccinia, 317; variola, 319; varicella, 321; papular diseases, lichen, prurigo, 321; bullar diseases, pemphigus, 322; rupia, 323; vesicular diseases, eczema, 324; miliaria, scabies, 325; herpes, 326; tubercular diseases, elephantiasis, 326; frambœsia, lupus, 327; scaly diseases, lepra, pityriasis, 328; ichthyosis, psoriasis, 329; pellagra, 330; syphilitic diseases, exanthematous, vesicular, 330; pustular, tubercular, papular, 331; scaly, 332; stains, lentigo, ephelis, albinism, 333; nigritism, 333
Small bowel, ulceration, 533; disease of glands in typhoid fever, 534; hypertrophy, atrophy, 542; contraction and dilatation, 542; tubercles, 542; carcinoma, melanosis, 543; concretions, fatty discharges, 544; laceration, 545; internal strangulation, 547; intussusception, 551; hernia, 553; abnormal pouches, 554; wounds, 555; artificial anus, 560
Softening, 87; causes, 88; of tubercles, 161; bones, 285; brain, 344–348; spinal cord, 364; heart, 455; œsophagus, 497; liver, 600; spleen, 621; pancreas, 627; kidney, 637; uterus, 713; ovaries, 733; gastro-enteric mucous membrane, 518; do. after death, 520
Solids and fluids, 33

Spermatic cord, encysted hydrocele, varicocele, 692; neuralgia, 693
Spicular transformation, 120
Spinal cord, inflammation, suppuration, softening, 364; induration, hypertrophy, atrophy, hydrorachitis, 365
Spina bifida, 365; analysis of fluid contents, 366
Spleen, 619; inflammation, 620; suppuration, 620; abscess, 621; gangrene, 621; softening, 621; induration and hepatization, 623; hypertrophy, 623; atrophy and tubercles, 624; lardaceous degeneration, 624; calcareous matter, ossification, and hydatids, 625; fibro-cartilaginous, 625; serous cysts, apoplexy, 626; laceration, 626
Stains, 332
Stratiform tubercular deposit, 154; scirrhus, 171; encephaloid, 178
Stomach and bowels, 500
Stomach, ulceration of, 522; perforation, 523; hypertrophy, 524; warty excrescences, 525; hypertrophy of submucous tissue, 525; of muscular coat, 525; atrophy, 526; dilatation, 526; contraction, 526; tumors, carcinoma, 527; laceration, rupture, 529
Stricture of urethra, 699
Strongylus, 649
Suggillations, 222
Suppuration, a result of inflammation, 72; muscles, 229; veins, 258; lymphatics, 263; joints, 270; synovial membrane, 273; bones, 280; dura mater, 356; brain, 341; spinal cord, 364; nerves, 368; tympanum, 388; thyroid gland, 394; lungs, 415; pleura, 443; heart, 455; gums, 491; œsophagus, 497; gastro-enteric mucous membrane, 511; peritoneum, 586; liver, 597; spleen, 620; kidneys, 635; testicles, 687
Supra-renal capsules, 631
Sycosis, 315
Syphilitic diseases of skin, 330; exanthematous, vesicular, 331; pustular, tubercular, papular, 332; scaly, 332
Synovial membrane, 272; inflammation of, 272; suppuration, 273; ulceration, 273; chalk-stones, 274

Tænia solium, 584; lata, 584
Tape-worm, 584
Teeth, caries of, 485; gangrene, inflammation, 486; exostosis, 487; calcareous concretions, 488; effects of age on, 488; in ovaries, 737
Tendons, mode of union when divided, 234; regeneration, inflammation, 235; ossification, atrophy, ganglions, 236
Tetter, 239
Testicle, weight and volume, 683; vaginal sac, hydrocele, 683; hæmatocele, 686; concretions, acute and chronic inflammation of testicle, 687; scirrhus and encephaloid, 688; colloid, cancer, melanosis, tubercles, 689; hydatids, 689; cartilage, ossification, 690; hypertrophy and atrophy, 692
Thoracic duct, aneurism of, obliteration, 264
Thymus gland, 391; diseases, 391
Thyroid gland, 393; diseases, 393
Tissues, formation and combination of, 34; cellular tissue, 218; adipose, 223; muscular, 227
Tongue, inflammation of, 479; ulceration, aphthæ, hypertrophy, 480; of mucous membrane, 481; papillæ, atrophy, vesicles, cancer, malformation, 482
Tonsils, inflammation, 492; suppuration, gangrene, ulceration, hypertrophy, 493; scirrhus, encysted tumor, tubercles, encephaloid, 494; calcareous concretions, 494
Trachea, trachitis, ulceration, 403; dilatation, laceration, ossification, stricture, 404
Transformations, 117; cellular, 117; mucous, fibrous, cartilaginous, 119; osseous, 119; adipose, 121
Transfusion, experiments on, 211
Trichina spiralis, 233
Tricocephaloid worm, 583
Tubercle, 148; seat of, how influenced by age, 149; comparative frequency in different organs, 150; most frequent between 20th and 40th years; occurs at all periods of life; met with in lower animals, 151; composition, 152; miliary tubercle, encysted, 153; tuberculous infiltration, stratiform do., 154; gray granulation, 155; origin and nature, 156; organization, 156; microscopical elements, 160; softening of, 161; calcareous degeneration, 163; muscles, 231; lymphatics, 263; bones, 299; of brain, 353; thyroid gland, 396; lungs, 427 (*see* phthisis); small bowels, 542; peritoneum, 590; liver, 607; spleen, 624; pancreas, 630; kidney, 647; testicle, 689; seminal vesicle, 694; uterus, 723
Tubercular diseases of skin, 326
Tuberoid transformations, 120; melanosis, 166; scirrhus, 170; encephaloid, 177
Tympanum, inflammation, 388; suppuration, 388

Ulceration, 95; causes, 96; nature, 97. (For ulceration, see the different organs.)
Ungueal matrix, 335
Union by first intention, 71
Ureter, 651
Urethra, male, inflammation of, 698; stricture, 699; malformations, 701; urethra of female, 746
Uric calculus, 672
Urinary apparatus, 631
Urinary bladder, 652; inflammation, suppuration, softening, hypertrophy, gan-

grene, 654; atrophy, cysts, ulceration, encephaloid, 657; neuralgia, tubercle, rupture, 658; worms, 659; calculi, 672; uric acid, 672; uro-ammoniac, 673; oxalic, phosphatic, ammoniaco-magnesian phosphate, 674; fusible and cystic calculus, 674; xanthic oxide, fibrinous, 675
Urine, analysis of, diseases, 662; diabetes insipidus, 662; excessive secretion, 662; kiesteine, diabetes mellitus, 667; oil in urine, 667; bluish and black, 667; hairs in urine, 667; quantity, color, and odor, 668; density, 669; lithic deposit, 669; yellow and red amorphous sediments, 670; crystallized sediments, 670; oxalic and phosphatic deposits, 671
Urticaria, 312
Uro-ammoniac calculus, 673
Uterus, weight and volume, 707; malformations, 708; malposition, 710; retroversion, anteversion, 711; prolapse, inversion, 711; inflammation, 711; ulceration, softening, 713; induration, hypertrophy, atrophy, 714; contraction of mouth, 714; enlargement of mucous follicles, 715; fibrous tumors, 715; polypes, 717; transformations, 719; malignant disease of uterus, 720; tubercles, 723; rupture, 723; hemorrhage, 724; water, air, 725; hair, hydatids, 725; moles, 728
Uvula, fissure of, 495; hypertrophy, 495

Vaccinia, 317
Vagina, inflammation, polypes, obstruction of, 742; prolapse, 744; short, double; bloody infiltration, ulcers, excrescences, 743
Varicella, 321
Varicose aneurism, 250; veins, 259
Variola, 319
Veins, inflammation, suppuration, 257; ulceration, chronic inflammation, 258; dilatation, hypertrophy, 259; obliteration, calcareous deposits, phlebolites, 260; admission of air into veins, 261
Vermiform appendage, inflammation and ulceration of, 570
Verruca, 305
Vesicular diseases, 323
Vestibule, 390
Vitreous humor, 385

Wardrop on want of coagulability of blood, 203; hereditary case of, 204
Warts, 305
Worms, intestinal, 580

Xanthic calculus, 675

Yaws, 327
Yellow fever, blood in, 214

THE END.

# HENRY C. LEA'S

(LATE LEA & BLANCHARD'S)

# CLASSIFIED CATALOGUE

OF

# MEDICAL AND SURGICAL PUBLICATIONS.

In asking the attention of the profession to the works contained in the following pages, the publisher would state that no pains are spared to secure a continuance of the confidence earned for the publications of the house by their careful selection and accuracy and finish of execution.

The printed prices are those at which books can generally be supplied by booksellers throughout the United States, who can readily procure for their customers any works not kept in stock. Where access to bookstores is not convenient, books will be sent by mail post-paid on receipt of the price, but no risks are assumed either on the money or the books, and no publications but my own are supplied. Gentlemen will therefore in most cases find it more convenient to deal with the nearest bookseller.

An ILLUSTRATED CATALOGUE, of 64 octavo pages, handsomely printed, will be forwarded by mail, postpaid, on receipt of ten cents.

HENRY C. LEA.

Nos. 706 and 708 SANSOM ST., PHILADELPHIA, Jan. 1872.

---

ADDITIONAL INDUCEMENT FOR SUBSCRIBERS TO

## THE AMERICAN JOURNAL OF THE MEDICAL SCIENCES.

### THREE MEDICAL JOURNALS, containing over 2000 LARGE PAGES,

### Free of Postage, for SIX DOLLARS Per Annum.

**TERMS FOR 1872:**

THE AMERICAN JOURNAL OF THE MEDICAL SCIENCES, and THE MEDICAL NEWS AND LIBRARY, both free of postage, } Five Dollars per annum, in advance.

OR,

THE AMERICAN JOURNAL OF THE MEDICAL SCIENCES, published quarterly (1150 pages per annum), with THE MEDICAL NEWS AND LIBRARY, monthly (384 pp. per annum), and THE HALF-YEARLY ABSTRACT OF THE MEDICAL SCIENCES, published Feb. and August (600 pages per annum), all free of postage. } Six Dollars per annum in advance.

*SEPARATE SUBSCRIPTIONS TO*

THE AMERICAN JOURNAL OF THE MEDICAL SCIENCES, subject to postage when not paid for in advance, Five Dollars.

THE MEDICAL NEWS AND LIBRARY, free of postage, in advance, One Dollar.

THE HALF-YEARLY ABSTRACT, Two Dollars and a Half per annum in advance. Single numbers One Dollar and a Half.

It is manifest that only a very wide circulation can enable so vast an amount of valuable practical matter to be supplied at a price so unprecedentedly low. The publisher, therefore, has much gratification in stating that the rapid and steady increase in the subscription list promises to render the enterprise a permanent one, and it is with especial pleasure that he acknowledges the valuable assistance spontaneously rendered by so many of the old subscribers to the "JOURNAL," who have kindly made

## *DUNGLISON (ROBLEY), M.D.,*

*Professor of Institutes of Medicine in Jefferson Medical College, Philadelphia.*

**MEDICAL LEXICON; A DICTIONARY OF MEDICAL SCIENCE: Containing a concise explanation of the various Subjects and Terms of Anatomy, Physiology, Pathology, Hygiene, Therapeutics, Pharmacology, Pharmacy, Surgery, Obstetrics, Medical Jurisprudence, and Dentistry. Notices of Climate and of Mineral Waters; Formulæ for Officinal, Empirical, and Dietetic Preparations; with the Accentuation and Etymology of the Terms, and the French and other Synonymes; so as to constitute a French as well as English Medical Lexicon. Thoroughly Revised, and very greatly Modified and Augmented. In one very large and handsome royal octavo volume of 1048 double-columned pages, in small type; strongly done up in extra cloth, $6 00; leather, raised bands, $6 75.**

The object of the author from the outset has not been to make the work a mere lexicon or dictionary of terms, but to afford, under each, a condensed view of its various medical relations, and thus to render the work an epitome of the existing condition of medical science. Starting with this view, the immense demand which has existed for the work has enabled him, in repeated revisions, to augment its completeness and usefulness, until at length it has attained the position of a recognized and standard authority wherever the language is spoken. The mechanical execution of this edition will be found greatly superior to that of previous impressions. By enlarging the size of the volume to a royal octavo, and by the employment of a small but clear type, on extra fine paper, the additions have been incorporated without materially increasing the bulk of the volume, and the matter of two or three ordinary octavos has been compressed into the space of one not unhandy for consultation and reference.

It would be a work of supererogation to bestow a word of praise upon this Lexicon. We can only wonder at the labor expended, for whenever we refer to its pages for information we are seldom disappointed in finding all we desire, whether it be in accentuation, etymology, or definition of terms.—*New York Medical Journal*, November, 1865.

It would be mere waste of words in us to express our admiration of a work which is so universally and deservedly appreciated. The most admirable work of its kind in the English language. As a book of reference it is invaluable to the medical practitioner, and in every instance that we have turned over its pages for information we have been charmed by the clearness of language and the accuracy of detail with which each abounds. We can most cordially and confidently commend it to our readers.—*Glasgow Medical Journal*, January, 1866.

A work to which there is no equal in the English language.—*Edinburgh Medical Journal*.

It is something more than a dictionary, and something less than an encyclopædia. This edition of the well-known work is a great improvement on its predecessors. The book is one of the very few of which it may be said with truth that every medical man should possess it.—*London Medical Times*, Aug. 26, 1865.

Few works of the class exhibit a grander monument of patient research and of scientific lore. The extent of the sale of this lexicon is sufficient to testify to its usefulness, and to the great service conferred by Dr. Robley Dunglison on the profession, and indeed on others, by its issue.—*London Lancet*, May 13, 1865.

The old edition, which is now superseded by the new, has been universally looked upon by the medical profession as a work of immense research and great value. The new has increased usefulness; for medicine, in all its branches, has been making such progress that many new terms and subjects have recently been introduced: all of which may be found fully defined in the present edition. We know of no other dictionary in the English language that can bear a comparison with it in point of completeness of subjects and accuracy of statement.—*N. Y. Druggists' Circular*, 1865.

For many years Dunglison's Dictionary has been the standard book of reference with most practitioners in this country, and we can certainly commend this work to the renewed confidence and regard of our readers.—*Cincinnati Lancet*, April, 1865.

It is undoubtedly the most complete and useful medical dictionary hitherto published in this country. —*Chicago Med. Examiner*, February, 1865.

What we take to be decidedly the best medical dictionary in the English language. The present edition is brought fully up to the advanced state of science. For many a long year "Dunglison" has been at our elbow, a constant companion and friend, and we greet him in his replenished and improved form with especial satisfaction.—*Pacific Med. and Surg. Journal*, June 27, 1865.

This is, perhaps, the book of all others which the physician or surgeon should have on his shelves. It is more needed at the present day than a few years back.—*Canada Med. Journal*, July, 1865.

It deservedly stands at the head, and cannot be surpassed in excellence.—*Buffalo Med. and Surg. Journal*, April, 1865.

We can sincerely commend Dr. Dunglison's work as most thorough, scientific, and accurate. We have tested it by searching its pages for new terms, which have abounded so much of late in medical nomenclature, and our search has been successful in every instance. We have been particularly struck with the fulness of the synonymy and the accuracy of the derivation of words. It is as necessary a work to every enlightened physician as Worcester's English Dictionary is to every one who would keep up his knowledge of the English tongue to the standard of the present day. It is, to our mind, the most complete work of the kind with which we are acquainted.—*Boston Med. and Surg. Journal*, June 22, 1865.

We are free to confess that we know of no medical dictionary more complete; no one better, if so well adapted for the use of the student; no one that may be consulted with more satisfaction by the medical practitioner.—*Am. Jour. Med. Sciences*, April, 1865.

The value of the present edition has been greatly enhanced by the introduction of new subjects and terms, and a more complete etymology and accentuation, which renders the work not only satisfactory and desirable, but indispensable to the physician.—*Chicago Med. Journal*, April, 1865.

No intelligent member of the profession can or will be without it.—*St. Louis Med. and Surg. Journal*, April, 1865.

It has the rare merit that it certainly has no rival in the English language for accuracy and extent of references.—*London Medical Gazette*.

## *HOBLYN (RICHARD D.), M.D.*

**A DICTIONARY OF THE TERMS USED IN MEDICINE AND THE COLLATERAL SCIENCES. Revised, with numerous additions, by ISAAC HAYS, M.D., Editor of the "American Journal of the Medical Sciences." In one large royal 12mo. volume of over 500 double-columned pages; extra cloth, $1 50; leather, $2 00.**

It is the best book of definitions we have, and ought always to be upon the student's table.—*Southern Med. and Surg. Journal*.

## *NEILL (JOHN), M.D., and SMITH (FRANCIS G.), M.D.,*

*Prof. of the Institutes of Medicine in the Univ. of Penna.*

### AN ANALYTICAL COMPENDIUM OF THE VARIOUS

**BRANCHES OF MEDICAL SCIENCE; for the Use and Examination of Students. A new edition, revised and improved. In one very large and handsomely printed royal 12mo. volume, of about one thousand pages, with 374 wood cuts, extra cloth, $4; strongly bound in leather, with raised bands, $4 75.**

**The Compend of Drs. Neill and Smith is incomparably the most valuable work of its class ever published in this country. Attempts have been made in various quarters to squeeze Anatomy, Physiology, Surgery, the Practice of Medicine, Obstetrics, Materia Medica, and Chemistry into a single manual; but the operation has signally failed in the hands of all up to the advent of "Neill and Smith's" volume, which is quite a miracle of success. The outlines of the whole are admirably drawn and illustrated, and the authors are eminently entitled to the grateful consideration of the student of every class.—*N. O. Med. and Surg. Journal*.**

**There are but few students or practitioners of medicine unacquainted with the former editions of this unassuming though highly instructive work. The whole science of medicine appears to have been sifted, as the gold-bearing sands of El Dorado, and the precious facts treasured up in this little volume. A complete portable library so condensed that the student may make it his constant pocket companion.—*Western Lancet*.**

**In the rapid course of lectures, where work for the students is heavy, and review necessary for an examination, a compend is not only valuable, but it is almost a *sine qua non*. The one before us is, in most of the divisions, the most unexceptionable of all books of the kind that we know of. Of course it is useless for us to recommend it to all last course students, but there is a class to whom we very sincerely commend this cheap book as worth its weight in silver—that class is the graduates in medicine of more than ten years' standing, who have not studied medicine since. They will perhaps find out from it that the science is not exactly now what it was when they left it off.—*The Stethoscope*.**

## *HARTSHORNE (HENRY), M. D.,*

*Professor of Hygiene in the University of Pennsylvania.*

### A CONSPECTUS OF THE MEDICAL SCIENCES; containing

**Handbooks on Anatomy, Physiology, Chemistry, Materia Medica, Practical Medicine, Surgery, and Obstetrics. In one large royal 12mo. volume of 1000 closely printed pages, with over 300 illustrations on wood, extra cloth, $4 50; leather, raised bands, $5 25. (*Just Issued.*)**

**The ability of the author, and his practical skill in condensation, give assurance that this work will prove valuable not only to the student preparing for examination, but also to the practitioner desirous of obtaining within a moderate compass, a view of the existing condition of the various departments of science connected with medicine.**

**This work is a remarkably complete one in its way, and comes nearer to our idea of what a Conspectus should be than any we have yet seen. Prof. Hartshorne, with a commendable forethought, intrusted the preparation of many of the chapters on special subjects to experts, reserving only anatomy, physiology, and practice of medicine to himself. As a result we have every department worked up to the latest date and in a refreshingly concise and lucid manner. There are an immense amount of illustrations scattered throughout the work, and although they have often been seen before in the various works upon general and special subjects, yet they will be none the less valuable to the beginner. Every medical student who desires a reliable refresher to his memory when the pressure of lectures and other college work crowds to prevent him from having an opportunity to drink deeper in the larger works, will find this one of the greatest utility. It is thoroughly trustworthy from beginning to end; and as we have before intimated, a remarkably truthful outline sketch of the present state of medical science. We could hardly expect it should be otherwise, however, under the charge of such a thorough medical scholar as the author has already proved himself to be.—*N. York Med. Record*, March 15, 1869.**

## *LUDLOW (J. L.), M. D.*

### A MANUAL OF EXAMINATIONS upon Anatomy, Physiology,

**Surgery, Practice of Medicine, Obstetrics, Materia Medica, Chemistry, Pharmacy, and Therapeutics. To which is added a Medical Formulary. Third edition, thoroughly revised and greatly extended and enlarged. With 370 illustrations. In one handsome royal 12mo. volume of 816 large pages, extra cloth, $3 25; leather, $3 75.**

**The arrangement of this volume in the form of question and answer renders it especially suitable for the office examination of students, and for those preparing for graduation.**

## *TANNER (THOMAS HAWKES), M. D., &c.*

### A MANUAL OF CLINICAL MEDICINE AND PHYSICAL DIAGNOSIS.

**Third American from the Second London Edition. Revised and Enlarged by TILBURY FOX, M. D., Physician to the Skin Department in University College Hospital. &c. In one neat volume small 12mo., of about 375 pages, extra cloth. $1 50. (*Just Issued.*)**

***** By reference to the "Prospectus of Journal" on page 3, it will be seen that this work is offered as a premium for procuring new subscribers to the "AMERICAN JOURNAL OF THE MEDICAL SCIENCES."**

**Taken as a whole, it is the most compact vade mecum for the use of the advanced student and junior practitioner with which we are acquainted.—*Boston Med. and Surg. Journal*, Sept. 22, 1870.**

**It contains so much that is valuable, presented in so attractive a form, that it can hardly be spared even in the presence of more full and complete works. The additions made to the volume by Mr. Fox very materially enhance its value, and almost make it a new work. Its convenient size makes it a valuable companion to the country practitioner, and if constantly carried by him, would often render him good service, and relieve many a doubt and perplexity.—*Leavenworth Med. Herald*, July, 1870.**

**The objections commonly, and justly, urged against the general run of "compends," "conspectuses," and other aids to indolence, are not applicable to this little volume, which contains in concise phrase just those practical details that are of most use in daily diagnosis, but which the young practitioner finds it difficult to carry always in his memory without some quickly accessible means of reference. Altogether, the book is one which we can heartily commend to those who have not opportunity for extensive reading, or who, having read much, still wish an occasional practical reminder.—N. Y. Med. Gazette, Nov. 10, 1870.**

## *GRAY (HENRY), F.R.S.,*

*Lecturer on Anatomy at St. George's Hospital, London.*

**ANATOMY, DESCRIPTIVE AND SURGICAL.** The Drawings by H. V. CARTER, M. D., late Demonstrator on Anatomy at St. George's Hospital; the Dissections jointly by the AUTHOR and DR. CARTER. A new American, from the fifth enlarged and improved London edition. In one magnificent imperial octavo volume, of nearly 900 pages, with 465 large and elaborate engravings on wood. Price in extra cloth, $6 00; leather, raised bands, $7 00. (*Just Issued.*)

The author has endeavored in this work to cover a more extended range of subjects than is customary in the ordinary text-books, by giving not only the details necessary for the student, but also the application of those details in the practice of medicine and surgery, thus rendering it both a guide for the learner, and an admirable work of reference for the active practitioner. The engravings form a special feature in the work, many of them being the size of nature, nearly all original, and having the names of the various parts printed on the body of the cut, in place of figures of reference, with descriptions at the foot. They thus form a complete and splendid series, which will greatly assist the student in obtaining a clear idea of Anatomy, and will also serve to refresh the memory of those who may find in the exigencies of practice the necessity of recalling the details of the dissecting room; while combining, as it does, a complete Atlas of Anatomy, with a thorough treatise on systematic, descriptive, and applied Anatomy, the work will be found of essential use to all physicians who receive students in their offices, relieving both preceptor and pupil of much labor in laying the groundwork of a thorough medical education.

Notwithstanding the enlargement of this edition, it has been kept at its former very moderate price, rendering it one of the cheapest works now before the profession.

The illustrations are beautifully executed, and render this work an indispensable adjunct to the library of the surgeon. This remark applies with great force to those surgeons practising at a distance from our large cities, as the opportunity of refreshing their memory by actual dissection is not always attainable.—*Canada Med. Journal*, Aug. 1870.

The work is too well known and appreciated by the profession to need any comment. No medical man can afford to be without it, if its only merit were to serve as a reminder of that which so soon becomes forgotten, when not called into frequent use, viz., the relations and names of the complex organism of the human body. The present edition is much improved.—*California Med. Gazette*, July, 1870.

Gray's Anatomy has been so long the standard of perfection with every student of anatomy, that we need do no more than call attention to the improvement in the present edition.—*Detroit Review of Med. and Pharm.*, Aug. 1870.

From time to time, as successive editions have appeared, we have had much pleasure in expressing the general judgment of the wonderful excellence of Gray's Anatomy.—*Cincinnati Lancet*, July, 1870.

Altogether, it is unquestionably the most complete and serviceable text-book in anatomy that has ever been presented to the student, and forms a striking contrast to the dry and perplexing volumes on the same subject through which their predecessors struggled in days gone by.—*N. Y. Med. Record*, June 15, 1870.

To commend Gray's Anatomy to the medical profession is almost as much a work of supererogation as it would be to give a favorable notice of the Bible in the religious press. To say that it is the most complete and conveniently arranged text book of its kind, is to repeat what each generation of students has learned as a tradition of the elders, and verified by personal experience.—*N. Y. Med. Gazette*, Dec. 17, 1870.

---

## *SMITH (HENRY H.), M.D.,* and *HORNER (WILLIAM E.), M.D.,*

*Prof. of Surgery in the Univ. of Penna., &c.* — *Late Prof. of Anatomy in the Univ. of Penna., &c.*

**AN ANATOMICAL ATLAS,** illustrative of the Structure of the Human Body. In one volume, large imperial octavo, extra cloth, with about six hundred and fifty beautiful figures. $4 50.

The plan of this Atlas, which renders it so peculiarly convenient for the student, and its superb artistical execution, have been already pointed out. We must congratulate the student upon the completion of this Atlas, as it is the most convenient work of the kind that has yet appeared; and we must add, the very beautiful manner in which it is "got up," is so creditable to the country as to be flattering to our national pride.—*American Medical Journal*

---

## *SHARPEY (WILLIAM), M.D.,* and *QUAIN (JONES & RICHARD).*

**HUMAN ANATOMY.** Revised, with Notes and Additions, by JOSEPH LEIDY, M.D., Professor of Anatomy in the University of Pennsylvania. Complete in two large octavo volumes, of about 1300 pages, with 511 illustrations; extra cloth, $6 00.

The very low price of this standard work, and its completeness in all departments of the subject, should command for it a place in the library of all anatomical students.

---

## *HODGES, (RICHARD M.), M.D.,*

*Late Demonstrator of Anatomy in the Medical Department of Harvard University.*

**PRACTICAL DISSECTIONS.** Second Edition, thoroughly revised. In one neat royal 12mo. volume, half-bound, $2 00.

The object of this work is to present to the anatomical student a clear and concise description of that which he is expected to observe in an ordinary course of dissections. The author has endeavored to omit unnecessary details, and to present the subject in the form which many years' experience has shown him to be the most convenient and intelligible to the student. In the revision of the present edition, he has sedulously labored to render the volume more worthy of the favor with which it has heretofore been received.

## *WILSON (ERASMUS), F.R.S.*

**A SYSTEM OF HUMAN ANATOMY, General and Special.** Edited by W. H. GOBRECHT, M. D., Professor of General and Surgical Anatomy in the Medical College of Ohio. Illustrated with three hundred and ninety-seven engravings on wood. In one large and handsome octavo volume, of over 600 large pages; extra cloth, $4 00; leather, $5 00.

The publisher trusts that the well-earned reputation of this long-established favorite will be more than maintained by the present edition. Besides a very thorough revision by the author, it has been most carefully examined by the editor, and the efforts of both have been directed to introducing everything which increased experience in its use has suggested as desirable to render it a complete text-book for those seeking to obtain or to renew an acquaintance with Human Anatomy. The amount of additions which it has thus received may be estimated from the fact that the present edition contains over one-fourth more matter than the last, rendering a smaller type and an enlarged page requisite to keep the volume within a convenient size. The author has not only thus added largely to the work, but he has also made alterations throughout, wherever there appeared the opportunity of improving the arrangement or style, so as to present every fact in its most appropriate manner, and to render the whole as clear and intelligible as possible. The editor has exercised the utmost caution to obtain entire accuracy in the text, and has largely increased the number of illustrations, of which there are about one hundred and fifty more in this edition than in the last, thus bringing distinctly before the eye of the student everything of interest or importance.

## *HEATH (CHRISTOPHER), F. R. C. S.,*

*Teacher of Operative Surgery in University College, London.*

**PRACTICAL ANATOMY: A Manual of Dissections.** From the Second revised and improved London edition. Edited, with additions, by W. W. KEEN, M. D., Lecturer on Pathological Anatomy in the Jefferson Medical College, Philadelphia. In one handsome royal 12mo. volume of 578 pages, with 247 illustrations. Extra cloth, $3 50; leather, $4 00. (*Just Issued.*)

Dr. Keen, the American editor of this work, in his preface, says: "In presenting this American edition of 'Heath's Practical Anatomy,' I feel that I have been instrumental in supplying a want long felt for *a real* dissector's manual," and this assertion of its editor we deem is fully justified, after an examination of its contents, for it is really an excellent work. Indeed, we do not hesitate to say, the best of its class with which we are acquainted; resembling Wilson in terse and clear description, excelling most of the so-called practical anatomical dissectors in the scope of the subject and practical selected matter. . . . In reading this work, one is forcibly impressed with the great pains the author takes to impress the subject upon the mind of the student He is full of rare and pleasing little devices to aid memory in maintaining its hold upon the slippery slopes of anatomy. —*St. Louis Med and Surg. Journal*, Mar. 10, 1871.

It appears to us certain that, as a guide in dissection, and as a work containing facts of anatomy in brief and easily understood form, this manual is complete. This work contains, also, very perfect illustrations of parts which can thus be more easily understood and studied; in this respect it compares favorably with works of much greater pretension.

Such manuals of anatomy are always favorite works with medical students. We would earnestly recommend this one to their attention; it has excellences which make it valuable as a guide in dissecting, as well as in studying anatomy.—*Buffalo Medical and Surgical Journal*, Jan. 1871.

The first English edition was issued about six years ago, and was favorably received not only on account of the great reputation of its author, but also from its great value and excellence as a guide-book to the practical anatomist. The American edition has undergone some alterations and additions which will no doubt enhance its value materially. The convenience of the student has been carefully consulted in the arrangement of the text, and the directions given for the prosecution of certain dissections will be duly appreciated.—*Canada Lancet*, Feb. 1871.

This is an excellent Dissector's Manual; one which is not merely a descriptive manual of anatomy, but a guide to the student at the dissecting table, enabling him, though a beginner, to prosecute his work intelligently, and without assistance. The American editor has made many valuable alterations and additions to the original work.—*Am. Journ. of Obstetrics*, Feb. 1871.

## *MACLISE (JOSEPH).*

**SURGICAL ANATOMY.** By JOSEPH MACLISE, Surgeon. In one volume, very large imperial quarto; with 68 large and splendid plates, drawn in the best style and beautifully colored, containing 190 figures, many of them the size of life; together with copious explanatory letter-press Strongly and handsomely bound in extra cloth. Price $14 00.

As no complete work of the kind has heretofore been published in the English language, the present volume will supply a want long felt in this country of an accurate and comprehensive Atlas of Surgical Anatomy, to which the student and practitioner can at all times refer to ascertain the exact relative positions of the various portions of the human frame towards each other and to the surface, as well as their abnormal deviations. Notwithstanding the large size, beauty and finish of the very numerous illustrations, it will be observed that the price is so low as to place it within the reach of all members of the profession.

We know of no work on surgical anatomy which can compete with it.—*Lancet.*

The work of Maclise on surgical anatomy is of the highest value. In some respects it is the best publication of its kind we have seen, and is worthy of a place in the library of any medical man, while the student could scarcely make a better investment than this.—*The Western Journal of Medicine and Surgery.*

No such lithographic illustrations of surgical regions have hitherto, we think, been given. While the operator is shown every vessel and nerve where an operation is contemplated, the exact anatomist is refreshed by those clear and distinct dissections, which every one must appreciate who has a particle of enthusiasm. The English medical press has quite exhausted the words of praise, in recommending this admirable treatise. Those who have any curiosity to gratify, in reference to the perfectibility of the lithographic art in delineating the complex mechanism of the human body, are invited to examine our specimen copy. If anything will induce surgeons and students to patronize a book of such rare value and everyday importance to them, it will be a survey of the artistical skill exhibited in these fac-similes of nature.—*Boston Med. and Surg. Journal.*

---

**HORNER'S SPECIAL ANATOMY AND HISTOLOGY.** Eighth edition, extensively revised and modified. | In 2 vols. 8vo., of over 1000 pages, with more than 300 wood-cuts; extra cloth, $6 00.

## *MARSHALL (JOHN), F. R. S.,*

*Professor of Surgery in University College, London, &c.*

### OUTLINES OF PHYSIOLOGY, HUMAN AND COMPARATIVE.

With Additions by FRANCIS GURNEY SMITH, M. D., Professor of the Institutes of Medicine in the University of Pennsylvania, &c. With numerous illustrations. In one large and handsome octavo volume, of 1026 pages, extra cloth, $6 50; leather, raised bands. $7 50.

In fact, in every respect, Mr. Marshall has presented us with a most complete, reliable, and scientific work, and we feel that it is worthy our warmest commendation.—*St. Louis Med. Reporter*, Jan. 1869.

This is an elaborate and carefully prepared digest of human and comparative physiology, designed for the use of general readers, but more especially serviceable to the student of medicine. Its style is concise, clear, and scholarly; its order perspicuous and exact, and its range of topics extended. The author and his American editor have been careful to bring to the illustration of the subject the important discoveries of modern science in the various cognate departments of investigation. This is especially visible in the variety of interesting information derived from the departments of chemistry and physics. The great amount and variety of matter contained in the work is strikingly illustrated by turning over the copious index, covering twenty-four closely printed pages in double columns.—*Silliman's Journal*, Jan. 1869.

We doubt if there is in the English language any compend of physiology more useful to the student than this work.—*St. Louis Med. and Surg. Journal*, Jan. 1869.

It quite fulfils, in our opinion, the author's design of making it truly *educational* in its character—which is, perhaps, the highest commendation that can be asked.—*Am. Journ. Med. Sciences*, Jan. 1869.

We may now congratulate him on having completed the latest as well as the best summary of modern physiological science, both human and comparative, with which we are acquainted. To speak of this work in the terms ordinarily used on such occasions would not be agreeable to ourselves, and would fail to do justice to its author. To write such a book requires a varied and wide range of knowledge, considerable power of analysis, correct judgment, skill in arrangement, and conscientious spirit. It must have entailed great labor, but now that the task has been fulfilled, the book will prove not only invaluable to the student of medicine and surgery, but serviceable to all candidates in natural science examinations, to teachers in schools, and to the lover of nature generally. In conclusion, we can only express the conviction that the merits of the work will command for it that success which the ability and vast labor displayed in its production so well deserve.—*London Lancet*, Feb. 22, 1868.

If the possession of knowledge, and peculiar aptitude and skill in expounding it, qualify a man to write an educational work, Mr. Marshall's treatise might be reviewed favorably without even opening the covers. There are few, if any, more accomplished anatomists and physiologists than the distinguished professor of surgery at University College; and he has long enjoyed the highest reputation as a teacher of physiology, possessing remarkable powers of clear exposition and graphic illustration. We have rarely the pleasure of being able to recommend a text-book so unreservedly as this.—*British Med. Journal*, Jan. 25, 1868.

## *CARPENTER (WILLIAM B.), M. D., F. R. S.,*

*Examiner in Physiology and Comparative Anatomy in the University of London.*

### PRINCIPLES OF HUMAN PHYSIOLOGY; with their chief applications to Psychology, Pathology, Therapeutics, Hygiene and Forensic Medicine.

A new American from the last and revised London edition. With nearly three hundred illustrations. Edited, with additions, by FRANCIS GURNEY SMITH, M. D., Professor of the Institutes of Medicine in the University of Pennsylvania, &c. In one very large and beautiful octavo volume, of about 900 large pages, handsomely printed; extra cloth, $5 50; leather, raised bands, $6 50.

With Dr. Smith, we confidently believe "that the present will more than sustain the enviable reputation already attained by former editions, of being one of the fullest and most complete treatises on the subject in the English language." We know of none from the pages of which a satisfactory knowledge of the physiology of the human organism can be as well obtained, none better adapted for the use of such as take up the study of physiology in its reference to the institutes and practice of medicine.—*Am. Jour. Med. Sciences.*

We doubt not it is destined to retain a strong hold on public favor, and remain the favorite text-book in our colleges.—*Virginia Medical Journal.*

The above is the title of what is emphatically *the* great work on physiology; and we are conscious that it would be a useless effort to attempt to add anything to the reputation of this invaluable work, and can only say to all with whom our opinion has any influence, that it is our *authority*.—*Atlanta Med. Journal.*

## *BY THE SAME AUTHOR.*

### PRINCIPLES OF COMPARATIVE PHYSIOLOGY.

New American, from the Fourth and Revised London Edition. In one large and handsome octavo volume, with over three hundred beautiful illustrations. Pp. 752. Extra cloth, $5 00.

As a complete and condensed treatise on its extended and important subject, this work becomes a necessity to students of natural science, while the very low price at which it is offered places it within the reach of all.

## *KIRKES (WILLIAM SENHOUSE), M. D.*

### A MANUAL OF PHYSIOLOGY.

A new American from the third and improved London edition. With two hundred illustrations. In one large and handsome royal 12mo. volume. Pp. 586. Extra cloth, $2 25; leather, $2 75.

It is at once convenient in size, comprehensive in design, and concise in statement, and altogether well [illegible]pted for the purpose designed.—*St. Louis Med. [illegible] Surg. Journal.*

physiological reader will find it a most excellent guide in the study of physiology in its most advanced and perfect form. The author has shown himself capable of giving details sufficiently ample in a condensed and concentrated shape, on a science in which it is necessary at once to be correct and not lengthened.—*Edinburgh Med. and Surg. Journal.*

### *DALTON (J. C.), M. D.,*

*Professor of Physiology in the College of Physicians and Surgeons, New York, &c.*

**A TREATISE ON HUMAN PHYSIOLOGY.** Designed for the use of Students and Practitioners of Medicine. Fifth edition, revised, with nearly three hundred illustrations on wood. In one very beautiful octavo volume, of over 700 pages, extra cloth, $5 25; leather, $6 25. (*Now Ready.*)

*Preface to the Fifth Edition.*

In preparing the present edition of this work, the general plan and arrangement of the previous editions have been retained, so far as they have been found useful and adapted to the purposes of a text-book for students of medicine. The incessant advance of all the natural and physical sciences, never more active than within the last five years, has furnished many valuable aids to the special investigations of the physiologist: and the progress of physiological research, during the same period, has required a careful revision of the entire work, and the modification or rearrangement of many of its parts. At this day, nothing is regarded as of any value in natural science which is not based upon direct and intelligible observation or experiment; and, accordingly, the discussion of doubtful or theoretical questions has been avoided, as a general rule, in the present volume, while new facts, from whatever source, if fully established, have been added and incorporated with the results of previous investigation. A number of new illustrations have been introduced, and a few of the older ones, which seemed to be no longer useful, have been omitted. In all the changes and additions thus made, it has been the aim of the writer to make the book, in its present form, a faithful exponent of the actual conditions of physiological science.

NEW YORK, October, 1871.

In this, the standard text-book on Physiology, all that is needed to maintain the favor with which it is regarded by the profession, is the author's assurance that it has been thoroughly revised and brought up to a level with the advanced science of the day. To accomplish this has required some enlargement of the work, but no advance has been made in the price.

A few notices of previous editions are subjoined.

It is no disparagement of the many excellent works on physiology, published prior to that of Dalton, to say that none of them, either in plan of arrangement or clearness of execution, could be compared with his for the use of students or general practitioners of medicine. For this purpose his book has no equal in the English language.—*Western Journal of Medicine*, Nov. 1867.

A capital text-book in every way. We are, therefore, glad to see it in its fourth edition. It has already been examined at full length in these columns, so that we need not now further advert to it beyond remarking that both revision and enlargement have been most judicious.—*London Med. Times and Gazette*, Oct. 19, 1867.

No better proof of the value of this admirable work could be produced than the fact that it has already reached a fourth edition in the short space of eight years. Possessing in an eminent degree the merits of clearness and condensation, and being fully brought up to the present level of Physiology, it is undoubtedly one of the most reliable text-books upon this science that could be placed in the hands of the medical student.—*Am. Journal Med. Sciences*, Oct. 1867.

Prof. Dalton's work has such a well-established reputation that it does not stand in need of any recommendation. Ever since its first appearance it has become the highest authority in the English language; and that it is able to maintain the enviable position which it has taken, the rapid exhaustion of the different successive editions is sufficient evidence. The present edition, which is the fourth, has been thoroughly revised, and enlarged by the incorporation of all the many important advances which have lately been made in this rapidly progressing science. —*N. Y. Med. Record*, Oct. 15, 1867.

As it stands, we esteem it the very best of the physiological text-books, for the student, and the most concise reference and guide-book for the practitioner. —*N. Y. Med. Journal*, Oct. 1867.

The present edition of this now standard work fully sustains the high reputation of its accomplished author. It is not merely a reprint, but has been faithfully revised, and enriched by such additions as the progress of physiology has rendered desirable. Taken as a whole, it is unquestionably the most reliable and useful treatise on the subject that has been issued from the American press.—*Chicago Med. Journal*, Sept. 1867.

### *DUNGLISON (ROBLEY), M. D.,*

*Professor of Institutes of Medicine in Jefferson Medical College, Philadelphia.*

**HUMAN PHYSIOLOGY.** Eighth edition. Thoroughly revised and extensively modified and enlarged, with five hundred and thirty-two illustrations. In two large and handsomely printed octavo volumes of about 1500 pages, extra cloth. $7 00.

### *LEHMANN (C. G.).*

**PHYSIOLOGICAL CHEMISTRY.** Translated from the second edition by GEORGE E DAY, M. D., F. R. S., &c., edited by R. E. ROGERS, M. D., Professor of Chemistry in the Medical Department of the University of Pennsylvania, with illustrations selected from Funke's Atlas of Physiological Chemistry, and an Appendix of plates. Complete in two large and handsome octavo volumes, containing 1200 pages, with nearly two hundred illustrations, extra cloth. $6 00.

### *BY THE SAME AUTHOR.*

**MANUAL OF CHEMICAL PHYSIOLOGY.** Translated from the German, with Notes and Additions, by J CHESTON MORRIS, M. D., with an Introductory Essay on Vital Force, by Professor SAMUEL JACKSON, M. D., of the University of Pennsylvania. With illustrations on wood. In one very handsome octavo volume of 336 pages. extra cloth. $2 25.

### *TODD (ROBERT B.), M. D. F. R. S., and BOWMAN (W.), F. R. S.*

**THE PHYSIOLOGICAL ANATOMY AND PHYSIOLOGY OF MAN.** With about three hundred large and beautiful illustrations on wood. Complete in one large octavo volume of 950 pages, extra cloth. Price $4 75.

## *ATTFIELD (JOHN), Ph. D.,*

*Professor of Practical Chemistry to the Pharmaceutical Society of Great Britain, &c.*

### CHEMISTRY, GENERAL, MEDICAL, AND PHARMACEUTICAL;

**including the Chemistry of the U. S. Pharmacopœia. A Manual of the General Principles of the Science, and their Application to Medicine and Pharmacy. From the Second and Enlarged English Edition, revised by the author. In one handsome royal 12mo. volume of about 550 pages; extra cloth, $2 75; leather, $3 25.** (*Just Issued.*)

It contains a most admirable digest of what is specially needed by the medical student in all that relates to practical chemistry, and constitutes for him a sound and useful text-book on the subject. . . . We commend it to the notice of every medical, as well as pharmaceutical, student. We only regret that we had not the book to depend upon in working up the subject of practical and pharmaceutical chemistry for the University of London, for which it seems to us that it is exactly adapted. This is paying the book a high compliment.—*The Lancet.*

Dr. Attfield's book is written in a clear and able manner: it is a work *sui generis* and without a rival; it will be welcomed, we think, by every reader of the 'Pharmacopœia,' and is quite as well suited for the medical student as for the pharmacist.—*The Chemical News*

A valuable guide to practical medical chemistry, and an admirable companion to the "British Pharmacopœia." It is rare to find so many qualities combined, and quite curious to note how much valuable information finds a mutual interdependence.—*Medical Times and Gazette.*

It is almost the only book from which the medical student can work up the pharmacopœial chemistry required at his examinations.—*The Pharmaceutical Journal.*

At page 330 of the current volume of this journal, we remarked that "there is a sad dearth of [medical] students' text-books in chemistry." Dr. Attfield's volume, just published, is rather a new book than a second edition of his previous work, and more nearly realizes our ideal than any book we have before seen on the subject.—*The British Medical Journal.*

The introduction of new matter has not destroyed the original character of the work, as a treatise on pharmaceutical and medical chemistry, but has simply extended the foundations of these special departments of the science.—*The Chemist and Druggist.*

We believe that this manual has been already adopted as the class-book by many of the professors in the public schools throughout the United Kingdom. . . . In pharmaceutical chemistry applied to the pharmacopœia, we know of no rival. It is, therefore, particularly suited to the medical student.—*The Medical Press and Circular.*

It in every way fulfils the intention of the author. We can strongly recommend it as a most complete manual of chemistry, alike useful to the physician and pharmaceutist.—*Canada Med. Journ.*, Nov. '70.

## *ODLING (WILLIAM),*

*Lecturer on Chemistry, at St. Bartholomew's Hospital, &c.*

### A COURSE OF PRACTICAL CHEMISTRY, arranged for the Use

**of Medical Students. With Illustrations. From the Fourth and Revised London Edition. In one neat royal 12mo. volume, extra cloth. $2.** (*Lately Issued.*)

As a work for the practitioner it cannot be excelled It is written plainly and concisely, and gives in a very small compass the information required by the busy practitioner. It is essentially a work for the physician, and no one who purchases it will ever regret the outlay In addition to all that is usually given in connection with inorganic chemistry, there are most valuable contributions to toxicology, animal and organic chemistry, etc. The portions devoted to a discussion of these subjects are very excellent. In no work can the physician find more that is valuable and reliable in regard to urine, bile, milk, bone, urinary calculi, tissue composition, etc. The work is small, reasonable in price, and well published.—*Richmond and Louisville Med. Journal*, Dec. 1869.

## *BOWMAN (JOHN E.), M. D.*

### PRACTICAL HANDBOOK OF MEDICAL CHEMISTRY. Edited

**by C. L. BLOXAM, Professor of Practical Chemistry in King's College, London. Fifth American, from the fourth and revised English Edition. In one neat volume, royal 12mo., pp. 351, with numerous illustrations, extra cloth. $2 25.** (*Just Issued.*)

The fourth edition of this invaluable text-book of Medical Chemistry was published in England in October of the last year. The Editor has brought down the Handbook to that date, introducing, as far as was compatible with the necessary conciseness of such a work, all the valuable discoveries in the science which have come to light since the previous edition was printed. The work is indispensable to every student of medicine or enlightened practitioner. It is printed in clear type, and the illustrations are numerous and intelligible.—*Boston Med. and Surg. Journal.*

## *BY THE SAME AUTHOR.*

### INTRODUCTION TO PRACTICAL CHEMISTRY, INCLUDING

**ANALYSIS. Fifth American, from the fifth and revised London edition. With numerous illustrations. In one neat vol., royal 12mo., extra cloth. $2 25.** (*Just Issued.*)

One of the most complete manuals that has for a long time been given to the medical student.—*Athenæum.*

We regard it as realizing almost everything to be desired in an introduction to Practical Chemistry.

It is by far the best adapted for the Chemical student of any that has yet fallen in our way.—*British and Foreign Medico-Chirurgical Review.*

The best introductory work on the subject with which we are acquainted.—*Edinburgh Monthly Jour.*

## *GRAHAM (THOMAS), F.R.S.*

### THE ELEMENTS OF INORGANIC CHEMISTRY, including the

**Applications of the Science in the Arts. New and much enlarged edition, by HENRY WATTS and ROBERT BRIDGES, M. D. Complete in one large and handsome octavo volume, of over 800 very large pages, with two hundred and thirty-two wood-cuts, extra cloth. $6 50.**

**KNAPP'S TECHNOLOGY; or Chemistry Applied to the Arts, and to Manufactures. With American additions, by Prof. WALTER R. JOHNSON. In two very handsome octavo volumes, with 500 wood engravings, extra cloth, $6 00.**

## *FOWNES (GEORGE), Ph. D.*

**A MANUAL OF ELEMENTARY CHEMISTRY; Theoretical and Practical.** With one hundred and ninety-seven illustrations. A new American, from the tenth and revised London edition. Edited by ROBERT BRIDGES, M. D. In one large royal 12mo. volume, of about 850 pp., extra cloth, $2 75; leather, $3 25. (*Just Issued.*)

Some years having elapsed since the appearance of the last American edition, and several revisions having been made of the work in England during the interval, it will be found very greatly altered, and enlarged by about two hundred and fifty pages, containing nearly one half more matter than before. The editors, Mr. Watts and Dr. Bence Jones, have labored sedulously to render it worthy in all respects of the very remarkable favor which it has thus far enjoyed, by incorporating in it all the most recent investigations and discoveries, in so far as is compatible with its design as an elementary text-book. While its distinguishing characteristics have been preserved, various portions have been rewritten, and especial pains have been taken with the department of Organic Chemistry in which late researches have accumulated so many new facts and have enabled the subject to be systematized and rendered intelligible in a manner formerly impossible. As only a few months have elapsed since the work thus passed through the hands of Mr. Watts and Dr. Bence Jones, but little has remained to be done by the American editor. Such additions as seemed advisable have however been made, and especial care has been taken to secure, by the closest scrutiny, the accuracy so essential in a work of this nature.

Thus fully brought up to a level with the latest advances of science, and presented at a price within the reach of all, it is hoped that the work will maintain its position as the favorite text-book of the medical student.

This work is so well known that it seems almost superfluous for us to speak about it. It has been a favorite text-book with medical students for years, and its popularity has in no respect diminished. Whenever we have been consulted by medical students, as has frequently occurred, what treatise on chemistry they should procure, we have always recommended Fownes', for we regarded it as the best. There is no work that combines so many excellences. It is of convenient size, not prolix, of plain perspicuous diction, contains all the most recent discoveries, and is of moderate price.—*Cincinnati Med. Repertory*, Aug. 1869.

Large additions have been made, especially in the department of organic chemistry, and we know of no other work that has greater claims on the physician, pharmaceutist, or student, than this. We cheerfully recommend it as the best text-book on elementary chemistry, and bespeak for it the careful attention of students of pharmacy.—*Chicago Pharmacist*, Aug. 1869.

The American reprint of the tenth revised and corrected English edition is now issued, and represents the present condition of the science. No comments are necessary to insure it a favorable reception at the hands of practitioners and students.—*Boston Med. and Surg. Journal*, Aug. 12, 1869.

It will continue, as heretofore, to hold the first rank as a text-book for students of medicine.—*Chicago Med. Examiner*, Aug. 1869.

This work, long the recognized Manual of Chemistry, appears as a tenth edition, under the able editorship of Bence Jones and Henry Watts. The chapter on the General Principles of Chemical Philosophy, and the greater part of the organic chemistry, have been rewritten, and the whole work revised in accordance with the recent advances in chemical knowledge. It remains the standard text-book of chemistry.—*Dublin Quarterly Journal*, Feb. 1869.

There is probably not a student of chemistry in this country to whom the admirable manual of the late Professor Fownes is unknown. It has achieved a success which we believe is entirely without a parallel among scientific text-books in our language. This success has arisen from the fact that there is no English work on chemistry which combines so many excellences. Of convenient size, of attractive form, clear and concise in diction, well illustrated, and of moderate price, it would seem that every requisite for a student's hand-book has been attained. The ninth edition was published under the joint editorship of Dr. Bence Jones and Dr. Hofmann; the new one has been superintended through the press by Dr. Bence Jones and Mr. Henry Watts. It is not too much to say that it could not possibly have been in better hands. There is no one in England who can compare with Mr. Watts in experience as a compiler in chemical literature, and we have much pleasure in recording the fact that his reputation is well sustained by this, his last undertaking.—*The Chemical News*, Feb. 1869.

Here is a new edition which has been long watched for by eager teachers of chemistry. In its new garb, and under the editorship of Mr. Watts, it has resumed its old place as the most successful of text-books.—*Indian Medical Gazette*, Jan. 1, 1869.

## *BRANDE (WM. T.), D.C.L., and TAYLOR (ALFRED S.), M.D., F.R.S.*

**CHEMISTRY.** Second American edition, thoroughly revised by Dr. TAYLOR. In one handsome 8vo. volume of 764 pages, extra cloth, $5 00; leather, $6 00.

FROM DR. TAYLOR'S PREFACE.

"The revision of the second edition, in consequence of the death of my lamented colleague, has devolved entirely upon myself. Every chapter, and indeed every page, has been revised, and numerous additions made in all parts of the volume. These additions have been restricted chiefly to subjects having some practical interest, and they have been made as concise as possible, in order to keep the book within those limits which may retain for it the character of a Student's Manual."—*London*, June 29, 1867.

A book that has already so established a reputation, as has Brande and Taylor's Chemistry, can hardly need a notice, save to mention the additions and improvements of the edition. Doubtless the work will long remain a favorite text-book in the schools, as well as a convenient book of reference for all.—*N. Y. Medical Gazette*, Oct. 12, 1867.

For this reason we hail with delight the republication, in a form which will meet with general approval and command public attention, of this really valuable standard work on chemistry—more particularly as it has been adapted with such care to the wants of the general public. The well known scholarship of its authors, and their extensive researches for many years in experimental chemistry, have been long appreciated in the scientific world, but in this work they have been careful to give the largest possible amount of information with the most sparing use of technical terms and phraseology, so as to furnish the reader, "whether a student of medicine, or a man of the world, with a plain introduction to the science and practice of chemistry."—*Journal of Applied Chemistry*, Oct. 1867.

This second American edition of an excellent treatise on chemical science is not a mere republication from the English press, but is a revision and enlargement of the original, under the supervision of the surviving author, Dr. Taylor. The favorable opinion expressed on the publication of the former edition of this work is fully sustained by the present revision, in which Dr. T. has increased the size of the volume, by an addition of sixty-eight pages.—*Am. Journ. Med. Sciences*, Oct. 1867.

## *PARRISH (EDWARD),*

*Professor of Materia Medica in the Philadelphia College of Pharmacy.*

### A TREATISE ON PHARMACY. Designed as a Text-Book for the Student, and as a Guide for the Physician and Pharmaceutist. With many Formulæ and Prescriptions. Third Edition, greatly improved. In one handsome octavo volume, of 850 pages, with several hundred illustrations, extra cloth. $5 00; leather, $6 00.

**The immense amount of practical information condensed in this volume may be estimated from the fact that the Index contains about 4700 items. Under the head of Acids there are 312 references; under Emplastrum, 36; Extracts, 159; Lozenges, 25; Mixtures, 55; Pills, 56; Syrups, 131; Tinctures, 138; Unguentum, 57, &c.**

We have examined this large volume with a good deal of care, and find that the author has completely exhausted the subject upon which he treats; a more complete work, we think, it would be impossible to find. To the student of pharmacy the work is indispensable; indeed, so far as we know, it is the only one of its kind in existence, and even to the physician or medical student who can spare five dollars to purchase it, we feel sure the practical information he will obtain will more than compensate him for the outlay.—*Canada Med. Journal*, Nov. 1864.

The medical student and the practising physician will find the volume of inestimable worth for study and reference.—*San Francisco Med. Press*, July, 1864.

When we say that this book is in some respects the best which has been published on the subject in the English language for a great many years, we do not wish it to be understood as very extravagant praise. In truth, it is not so much the best as the only book.—*The London Chemical News*.

An attempt to furnish anything like an analysis of Parrish's very valuable and elaborate *Treatise on Practical Pharmacy* would require more space than we have at our disposal. This, however, is not so much a matter of regret, inasmuch as it would be difficult to think of any point, however minute and apparently trivial, connected with the manipulation of pharmaceutic substances or appliances which has not been clearly and carefully discussed in this volume. Want of space prevents our enlarging further on this valuable work, and we must conclude by a simple expression of our hearty appreciation of its merits.—*Dublin Quarterly Jour. of Medical Science*, August, 1864.

## *STILLÉ (ALFRED), M.D.,*

*Professor of Theory and Practice of Medicine in the University of Penna.*

### THERAPEUTICS AND MATERIA MEDICA; a Systematic Treatise on the Action and Uses of Medicinal Agents, including their Description and History. Third edition, revised and enlarged. In two large and handsome octavo volumes of about 1700 pages, extra cloth, $10; leather, $12.

Dr. Stille's splendid work on therapeutics and materia medica.—*London Med. Times*, April 8, 1865.

Dr. Stillé stands to-day one of the best and most honored representatives at home and abroad, of American medicine; and these volumes, a library in themselves, a treasure-house for every studious physician, assure his fame even had he done nothing more.—*The Western Journal of Medicine*, Dec. 1868.

We regard this work as the best one on Materia Medica in the English language, and as such it deserves the favor it has received.—*Am. Journ. Medical Sciences*, July 1868.

We need not dwell on the merits of the third edition of this magnificently conceived work. It is the work on Materia Medica, in which Therapeutics are primarily considered—the mere natural history of drugs being briefly disposed of. To medical practitioners this is a very valuable conception It is wonderful how much of the riches of the literature of Materia Medica has been condensed into this book. The references alone would make it worth possessing. But it is not a mere compilation. The writer exercises a good judgment of his own on the great doctrines and points of Therapeutics For purposes of practice, Stillé's book is almost unique as a repertory of information, empirical and scientific, on the actions and uses of medicines.—*London Lancet*, Oct. 31, 1868.

Through the former editions, the professional world is well acquainted with this work. At home and abroad its reputation as a standard treatise on Materia Medica is securely established It is second to no work on the subject in the English tongue, and, indeed, is decidedly superior, in some respects, to any other.—*Pacific Med. and Surg Journal*, July, 1868.

Stillé's Therapeutics is incomparably the best work on the subject.—*N. Y. Med. Gazette*, Sept. 26, 1868.

Dr Stillé's work is becoming the best known of any of our treatises on Materia Medica. . . . One of the most valuable works in the language on the subjects of which it treats.—*N. Y. Med. Journal*, Oct. 1868.

The rapid exhaustion of two editions of Prof. Stillé's scholarly work, and the consequent necessity for a third edition, is sufficient evidence of the high estimate placed upon it by the profession. It is no exaggeration to say that there is no superior work upon the subject in the English language. The present edition is fully up to the most recent advance in the science and art of therapeutics.—*Leavenworth Medical Herald*, Aug. 1868.

The work of Prof. Stillé has rapidly taken a high place in professional esteem, and to say that a third edition is demanded and now appears before us, sufficiently attests the firm position this treatise has made for itself. As a work of great research, and scholarship, it is safe to say we have nothing superior. It is exceedingly full, and the busy practitioner will find ample suggestions upon almost every important point of therapeutics.—*Cincinnati Lancet*, Aug. 1868.

## *GRIFFITH (ROBERT E.), M.D.*

### A UNIVERSAL FORMULARY, Containing the Methods of Preparing and Administering Officinal and other Medicines. The whole adapted to Physicians and Pharmaceutists. Second edition, thoroughly revised, with numerous additions, by ROBERT P. THOMAS, M.D., Professor of Materia Medica in the Philadelphia College of Pharmacy. In one large and handsome octavo volume of 650 pages, double-columns. Extra cloth, $4 00; leather, $5 00.

**Three complete and extended Indexes render the work especially adapted for immediate consultation. One, of DISEASES AND THEIR REMEDIES, presents under the head of each disease the remedial agents which have been usefully exhibited in it, with reference to the formulæ containing them—while another of PHARMACEUTICAL and BOTANICAL NAMES, and a very thorough GENERAL INDEX afford the means of obtaining at once any information desired. The Formulary itself is arranged alphabetically, under the heads of the leading constituents of the prescriptions.**

We know of none in our language, or any other, so comprehensive in its details.—*London Lancet*.

One of the most complete works of the kind in any language.—*Edinburgh Med. Journal*.

We are not cognizant of the existence of a parallel work.—*London Med. Gazette*.

## *PEREIRA (JONATHAN), M.D., F.R.S. and L.S.*

### MATERIA MEDICA AND THERAPEUTICS; being an Abridgment of the late Dr. Pereira's Elements of Materia Medica, arranged in conformity with the British Pharmacopœia, and adapted to the use of Medical Practitioners, Chemists and Druggists, Medical and Pharmaceutical Students, &c. By F. J. FARRE, M.D., Senior Physician to St. Bartholomew's Hospital, and London Editor of the British Pharmacopœia; assisted by ROBERT BENTLEY, M.R.C.S., Professor of Materia Medica and Botany to the Pharmaceutical Society of Great Britain; and by ROBERT WARINGTON, F.R.S., Chemical Operator to the Society of Apothecaries. With numerous additions and references to the United States Pharmacopœia, by HORATIO C. WOOD, M.D., Professor of Botany in the University of Pennsylvania. In one large and handsome octavo volume of 1040 closely printed pages, with 236 illustrations, extra cloth, $7 00; leather, raised bands, $8 00.

The task of the American editor has evidently been no sinecure, for not only has he given to us all that is contained in the abridgment useful for our purposes, but by a careful and judicious embodiment of over a hundred new remedies has increased the size of the former work fully one-third, besides adding many new illustrations, some of which are original. We unhesitatingly say that by so doing he has proportionately increased the value, not only of the condensed edition, but has extended the applicability of the great original, and has placed his medical countrymen under lasting obligations to him. The American physician now has all that is needed in the shape of a complete treatise on materia medica, and the medical student has a text-book which, for practical utility and intrinsic worth, stands unparalleled. Although of considerable size, it is none too large for the purposes for which it has been intended, and every medical man should, in justice to himself, spare a place for it upon his book-shelf, resting assured that the more he consults it the better he will be satisfied of its excellence.—*N. Y. Med. Record*, Nov. 15, 1866.

It will fill a place which no other work can occupy in the library of the physician, student, and apothecary.—*Boston Med. and Surg. Journal*, Nov. 8, 1866.

Of the many works on Materia Medica which have appeared since the issuing of the British Pharmacopœia, none will be more acceptable to the student and practitioner than the present. Pereira's Materia Medica had long ago asserted for itself the position of being the most complete work on the subject in the English language. But its very completeness stood in the way of its success. Except in the way of reference, or to those who made a special study of Materia Medica, Dr. Pereira's work was too full, and its perusal required an amount of time which few had at their disposal. Dr. Farre has very judiciously availed himself of the opportunity of the publication of the new Pharmacopœia, by bringing out an abridged edition of the great work. This edition of Pereira is by no means a mere abridged re-issue, but contains many improvements, both in the descriptive and therapeutical departments. We can recommend it as a very excellent and reliable text-book.—*Edinburgh Med. Journal*, February, 1866.

The reader cannot fail to be impressed, at a glance, with the exceeding value of this work as a compend of nearly all useful knowledge on the materia medica. We are greatly indebted to Professor Wood for his adaptation of it to our meridian. Without his emendations and additions it would lose much of its value to the American student. With them it is an American book.—*Pacific Medical and Surgical Journal*, December, 1866.

## *ELLIS (BENJAMIN), M.D.*

### THE MEDICAL FORMULARY: being a Collection of Prescriptions derived from the writings and practice of many of the most eminent physicians of America and Europe. Together with the usual Dietetic Preparations and Antidotes for Poisons. The whole accompanied with a few brief Pharmaceutic and Medical Observations. Twelfth edition, carefully revised and much improved by ALBERT H. SMITH, M. D. In one volume 8vo. of 376 pages, extra cloth, $3 00. (*Lately Published.*)

This work has remained for some time out of print, owing to the anxious care with which the Editor has sought to render the present edition worthy a continuance of the very remarkable favor which has carried the volume to the unusual honor of a TWELFTH EDITION. He has sedulously endeavored to introduce in it all new preparations and combinations deserving of confidence, besides adding two new classes, Antemetics and Disinfectants, with brief references to the inhalation of atomised fluids, the nasal douche of Thudichum, suggestions upon the method of hypodermic injection, the administration of anæsthetics, &c. &c. To accommodate these numerous additions, he has omitted much which the advance of science has rendered obsolete or of minor importance, notwithstanding which the volume has been increased by more than thirty pages. A new feature will be found in a copious Index of Diseases and their remedies, which cannot but increase the value of the work as a suggestive book of reference for the working practitioner. Every precaution has been taken to secure the typographical accuracy so necessary in a work of this nature, and it is hoped that the new edition will fully maintain the position which "ELLIS' FORMULARY" has long occupied.

## *CARSON (JOSEPH), M.D.,*

*Professor of Materia Medica and Pharmacy in the University of Pennsylvania, &c.*

### SYNOPSIS OF THE COURSE OF LECTURES ON MATERIA MEDICA AND PHARMACY, delivered in the University of Pennsylvania. With three Lectures on the Modus Operandi of Medicines. Fourth and revised edition, extra cloth, $3 00.

**DUNGLISON'S NEW REMEDIES, WITH FORMULÆ FOR THEIR PREPARATION AND ADMINISTRATION.** Seventh edition, with extensive additions. One vol. 8vo., pp. 770; extra cloth. $4 00.

**ROYLE'S MATERIA MEDICA AND THERAPEUTICS.** Edited by JOSEPH CARSON, M. D. With ninety-eight illustrations. 1 vol. 8vo., pp. 700, extra cloth. $3 00.

**CHRISTISON'S DISPENSATORY.** With copious additions, and 213 large wood-engravings. By R EGLESFELD GRIFFITH, M. D. One vol. 8vo., pp. 1000; extra cloth. $4 00.

**CARPENTER'S PRIZE ESSAY ON THE USE OF ALCOHOLIC LIQUORS IN HEALTH AND DISEASE.** New edition, with a Preface by D. F. CONDIE, M. D., and explanations of scientific words. In one neat 12mo. volume, pp. 178, extra cloth. 60 cents.

**DE JONGH ON THE THREE KINDS OF COD-LIVER OIL,** with their Chemical and Therapeutic Properties. 1 vol. 12mo., cloth. 75 cents.

## *GREEN (T. HENRY), M.D.,*

*Lecturer on Pathology and Morbid Anatomy at Charing-Cross Hospital Medical School.*

**PATHOLOGY AND MORBID ANATOMY.** With numerous Illustrations on Wood. In one very handsome octavo volume of over 250 pages, extra cloth, $2 50. (*Just Ready.*)

The scope and object of this volume can be gathered from the following condensed

### SUMMARY OF CONTENTS.

Introduction. Chapter I. The "Cell." II. Nutrition Arrested. III. Nutrition Impaired. IV. Fatty Degeneration. V. Mucoid and Colloid Degeneration. VI. Fatty Infiltration. VII. Amyloid Degeneration. VIII. Calcareous Degeneration. IX. Pigmentary Degeneration. X. Nutrition Increased. XI. New Formations. XII. The Fibromata. XIII. The Sarcomata. XIV. The Gummata. XV. The Myxomata. XVI. The Lipomata. XVII. The Enchondromata. XVIII. The Osteomata. XIX. The Lymphomata. XX. Tubercle. XXI. The Papillomata. XXII. The Adenomata. XXIII. The Carcinomata. XXIV. The Myomata, Neuromata, and Angeomata. XXV. Cysts. XXVI. Inflammation. XXVII. Inflammation of Non-Vascular Tissues. XXVIII. Inflammation of Vascular Connective Tissues. XXIX. Inflammation of Bloodvessels and Heart. XXX. Inflammation of Lymphatic Structures. XXXI. Inflammation of Mucous Membranes. XXXII. Inflammation of Serous Membranes. XXXIII. Inflammation of the Liver. XXXIV. Inflammation of the Kidney. XXXV. Inflammation of the Lungs. XXXVI. Inflammation of Brain and Spinal Cord. XXXVII. Changes in the Blood and Circulation. XXXVIII. Thrombosis. XXXIX. Embolism.

We have been very much pleased by our perusal of this little volume. It is the only one of the kind with which we are acquainted, and practitioners as well as students will find it a very useful guide; for the information is up to the day, well and compactly arranged, without being at all scanty.—*London Lancet*, Oct. 7, 1871.

## *GROSS (SAMUEL D.), M. D.,*

*Professor of Surgery in the Jefferson Medical College of Philadelphia.*

**ELEMENTS OF PATHOLOGICAL ANATOMY.** Third edition, thoroughly revised and greatly improved. In one large and very handsome octavo volume of nearly 800 pages, with about three hundred and fifty beautiful illustrations, of which a large number are from original drawings; extra cloth. $4 00.

## *JONES (C. HANDFIELD), F.R.S., and SIEVEKING (ED. H.), M.D.,*

*Assistant Physicians and Lecturers in St. Mary's Hospital.*

**A MANUAL OF PATHOLOGICAL ANATOMY.** First American edition, revised. With three hundred and ninety-seven handsome wood engravings. In one large and beautifully printed octavo volume of nearly 750 pages, extra cloth, $3 50.

## *BARCLAY (A. W.), M. D.*

**A MANUAL OF MEDICAL DIAGNOSIS;** being an Analysis of the Signs and Symptoms of Disease. Third American from the second and revised London edition. In one neat octavo volume of 451 pages, extra cloth. $3 50.

## *WILLIAMS (CHARLES J. B.), M.D.,*

*Professor of Clinical Medicine in University College, London.*

**PRINCIPLES OF MEDICINE.** An Elementary View of the Causes, Nature, Treatment, Diagnosis, and Prognosis of Disease; with brief remarks on Hygienics, or the preservation of health. A new American, from the third and revised London edition. In one octavo volume of about 500 pages, extra cloth. $3 50.

**GLUGE'S ATLAS OF PATHOLOGICAL HISTOLOGY.** Translated, with Notes and Additions, by JOSEPH LEIDY, M. D. In one volume, very large imperial quarto, with 320 copper-plate figures, plain and colored, extra cloth. $4 00.

**SIMON'S GENERAL PATHOLOGY,** as conducive to the Establishment of Rational Principles for the Prevention and Cure of Disease. In one octavo volume of 212 pages, extra cloth. $1 25.

**SOLLY ON THE HUMAN BRAIN;** its Structure, Physiology, and Diseases. From the Second and much enlarged London edition. In one octavo volume 500 pages, with 120 wood-cuts; extra cloth. $2 50.

**LA ROCHE ON YELLOW FEVER,** considered in its Historical, Pathological, Etiological, and Therapeutical Relations. In two large and handsome octavo volumes, of nearly 1500 pages, extra cloth, $7 00.

**HOLLAND'S MEDICAL NOTES AND REFLECTIONS.** 1 vol. 8vo., pp. 500, extra cloth. $3 50

**WHAT TO OBSERVE AT THE BEDSIDE AND AFTER DEATH IN MEDICAL CASES.** Published under the authority of the London Society for Medical Observation. From the second London edition. 1 vol. royal 12mo., extra cloth. $1 00.

**LAYCOCK'S LECTURES ON THE PRINCIPLES AND METHODS OF MEDICAL OBSERVATION AND RESEARCH.** For the use of advanced students and junior practitioners. In one very neat royal 12mo. volume, extra cloth. $1 00.

## *DUNGLISON, FORBES, TWEEDIE, AND CONOLLY.*

**THE CYCLOPÆDIA OF PRACTICAL MEDICINE:** comprising Treatises on the Nature and Treatment of Diseases, Materia Medica and Therapeutics, Diseases of Women and Children, Medical Jurisprudence, &c. &c. In four large super-royal octavo volumes, of 3254 double-columned pages, strongly and handsomely bound in leather, $15; extra cloth, $11.

⁂ This work contains no less than four hundred and eighteen distinct treatises, contributed by sixty-eight distinguished physicians.

## *FLINT (AUSTIN), M. D.,*

*Professor of the Principles and Practice of Medicine in Bellevue Med. College, N. Y.*

**A TREATISE ON THE PRINCIPLES AND PRACTICE OF MEDICINE**; designed for the use of Students and Practitioners of Medicine. Third edition, revised and enlarged. In one large and closely printed octavo volume of 1002 pages; handsome extra cloth, $6 00; or strongly bound in leather, with raised bands, $7 00. (*Lately Published.*)

By common consent of the English and American medical press, this work has been assigned to the highest position as a complete and compendious text-book on the most advanced condition of medical science. At the very moderate price at which it is offered it will be found one of the cheapest volumes now before the profession.

Admirable and unequalled.—*Western Journal of Medicine*, Nov. 1869.

Dr. Flint's work, though claiming no higher title than that of a text-book, is really more. He is a man of large clinical experience, and his book is full of such masterly descriptions of disease as can only be drawn by a man intimately acquainted with their various forms. It is not so long since we had the pleasure of reviewing his first edition, and we recognize a great improvement, especially in the general part of the work. It is a work which we can cordially recommend to our readers as fully abreast of the science of the day.—*Edinburgh Med. Journal*, Oct. '69.

One of the best works of the kind for the practitioner, and the most convenient of all for the student.—*Am. Journ. Med. Sciences*, Jan. 1869.

This work, which stands pre-eminently as the advance standard of medical science up to the present time in the practice of medicine, has for its author one who is well and widely known as one of the leading practitioners of this continent. In fact, it is seldom that any work is ever issued from the press more deserving of universal recommendation.—*Dominion Med. Journal*, May, 1869.

The third edition of this most excellent book scarcely needs any commendation from us. The volume, as it stands now, is really a marvel: first of all, it is excellently printed and bound—and we encounter that luxury of America, the ready-cut pages, which the Yankees are 'cute enough to insist upon—nor are these by any means trifles; but the contents of the book are astonishing. Not only is it wonderful that any one man can have grasped in his mind the whole scope of medicine with that vigor which Dr. Flint shows, but the condensed yet clear way in which this is done is a perfect literary triumph. Dr. Flint is pre-eminently one of the strong men, whose right to do this kind of thing is well admitted; and we say no more than the truth when we affirm that he is very nearly the only living man that could do it with such results as the volume before us.—*The London Practitioner*, March, 1869.

This is in some respects the best text-book of medicine in our language, and it is highly appreciated on the other side of the Atlantic, inasmuch as the first edition was exhausted in a few months. The second edition was little more than a reprint, but the present has, as the author says, been thoroughly revised. Much valuable matter has been added, and by making the type smaller, the bulk of the volume is not much increased. The weak point in many American works is pathology, but Dr. Flint has taken peculiar pains on this point, greatly to the value of the book. —*London Med. Times and Gazette*, Feb. 6, 1869.

Published in 1866, this valuable book of Dr. Flint's has in two years exhausted two editions, and now we gladly announce a third. We say we gladly announce it, because we are proud of it as a national representative work of not only American, but of cosmopolitan medicine. In it the practice of medicine is young and philosophical, based on reason and common sense, and as such, we hope it will be at the right hand of every practitioner of this vast continent. —*California Medical Gazette*, March, 1869.

Considering the large number of valuable works in the practice of medicine, already before the profession, the marked favor with which this has been received, necessitating a third edition in the short space of two years, indicates unmistakably that it is a work of more than ordinary excellence, and must be accepted as evidence that it has largely fulfilled the object for which the author intended it. A marked feature in the work, and one which particularly adapts it for the use of students as a text-book, and certainly renders it none the less valuable to the busy practitioner as a work of reference, is brevity and simplicity. The present edition has been thoroughly revised, and much new matter incorporated, derived, as the author informs us, both from his own clinical studies, and from the latest contributions to medical literature, thus bringing it fully up with the most recent advances of the science, and greatly enhancing its practical utility; while, by a slight modification of its typographical arrangement, the additions have been accommodated without materially increasing its bulk.—*St. Louis Med. Archives*, Feb. 1869.

If there be among our readers any who are not familiar with the treatise before us, we shall do them a service in persuading them to repair their omission forthwith. Combining to a rare degree the highest scientific attainments with the most practical common sense, and the closest habits of observation, the author has given us a volume which not only sets forth the results of the latest investigations of other laborers, but contains more original views than any other single work upon this well-worn theme within our knowledge.—*N. Y. Med. Gazette*, Feb. 27, 1869.

---

**BARLOW'S MANUAL OF THE PRACTICE OF MEDICINE.** With Additions by D. F. CONDIE, M. D. 1 vol. 8vo., pp. 600, cloth. $2 50.

**TODD'S CLINICAL LECTURES ON CERTAIN ACUTE DISEASES.** In one neat octavo volume, of 320 pages, extra cloth. $2 50.

---

## *PAVY (F. W.), M. D., F. R. S.,*

*Senior Asst. Physician to and Lecturer on Physiology, at Guy's Hospital, &c.*

**A TREATISE ON THE FUNCTION OF DIGESTION**; its Disorders and their Treatment. From the second London edition. In one handsome volume, small octavo, extra cloth, $2 00. (*Lately Published.*)

The work before us is one which deserves a wide circulation. We know of no better guide to the study of digestion and its disorders.—*St. Louis Med. and Surg. Journal*, July 10, 1869.

A thoroughly good book, being a careful systematic treatise, and sufficiently exhaustive for all practical purposes.—*Leavenworth Med. Herald*, July, 1869.

A very valuable work on the subject of which it treats. Small, yet it is full of valuable information. —*Cincinnati Med. Repertory*, June, 1869.

---

## *BRINTON (WILLIAM), M. D., F. R. S.*

**LECTURES ON THE DISEASES OF THE STOMACH**; with an Introduction on its Anatomy and Physiology. From the second and enlarged London edition. With illustrations on wood. In one handsome octavo volume of about 300 pages, extra cloth. $3 25.

## *GRAY (HENRY), F.R.S.,*

*Lecturer on Anatomy at St. George's Hospital, London.*

### ANATOMY, DESCRIPTIVE AND SURGICAL.

The Drawings by H. V. CARTER, M. D., late Demonstrator on Anatomy at St. George's Hospital; the Dissections jointly by the AUTHOR and DR. CARTER. A new American, from the fifth enlarged and improved London edition. In one magnificent imperial octavo volume, of nearly 900 pages, with 465 large and elaborate engravings on wood. Price in extra cloth, $6 00; leather, raised bands, $7 00. (*Just Issued.*)

The author has endeavored in this work to cover a more extended range of subjects than is customary in the ordinary text-books, by giving not only the details necessary for the student, but also the application of those details in the practice of medicine and surgery, thus rendering it both a guide for the learner, and an admirable work of reference for the active practitioner. The engravings form a special feature in the work, many of them being the size of nature, nearly all original, and having the names of the various parts printed on the body of the cut, in place of figures of reference, with descriptions at the foot. They thus form a complete and splendid series, which will greatly assist the student in obtaining a clear idea of Anatomy, and will also serve to refresh the memory of those who may find in the exigencies of practice the necessity of recalling the details of the dissecting room; while combining, as it does, a complete Atlas of Anatomy, with a thorough treatise on systematic, descriptive, and applied Anatomy, the work will be found of essential use to all physicians who receive students in their offices, relieving both preceptor and pupil of much labor in laying the groundwork of a thorough medical education.

Notwithstanding the enlargement of this edition, it has been kept at its former very moderate price, rendering it one of the cheapest works now before the profession.

The illustrations are beautifully executed, and render this work an indispensable adjunct to the library of the surgeon. This remark applies with great force to those surgeons practising at a distance from our large cities, as the opportunity of refreshing their memory by actual dissection is not always attainable.—*Canada Med. Journal*, Aug. 1870.

The work is too well known and appreciated by the profession to need any comment. No medical man can afford to be without it, if its only merit were to serve as a reminder of that which so soon becomes forgotten, when not called into frequent use, viz., the relations and names of the complex organism of the human body. The present edition is much improved.—*California Med. Gazette*, July, 1870.

Gray's Anatomy has been so long the standard of perfection with every student of anatomy, that we need do no more than call attention to the improvement in the present edition.—*Detroit Review of Med. and Pharm.*, Aug. 1870.

From time to time, as successive editions have appeared, we have had much pleasure in expressing the general judgment of the wonderful excellence of Gray's Anatomy.—*Cincinnati Lancet*, July, 1870.

Altogether, it is unquestionably the most complete and serviceable text-book in anatomy that has ever been presented to the student, and forms a striking contrast to the dry and perplexing volumes on the same subject through which their predecessors struggled in days gone by.—*N. Y. Med. Record*, June 15, 1870.

To commend Gray's Anatomy to the medical profession is almost as much a work of supererogation as it would be to give a favorable notice of the Bible in the religious press. To say that it is the most complete and conveniently arranged text book of its kind, is to repeat what each generation of students has learned as a tradition of the elders, and verified by personal experience.—*N. Y. Med. Gazette*, Dec. 17, 1870.

---

## *SMITH (HENRY H.), M.D.,* and *HORNER (WILLIAM E.), M.D.,*

*Prof. of Surgery in the Univ. of Penna., &c.* — *Late Prof. of Anatomy in the Univ. of Penna., &c.*

### AN ANATOMICAL ATLAS, illustrative of the Structure of the Human Body.

In one volume, large imperial octavo, extra cloth, with about six hundred and fifty beautiful figures. $4 50.

The plan of this Atlas, which renders it so peculiarly convenient for the student, and its superb artistical execution, have been already pointed out. We must congratulate the student upon the completion of this Atlas, as it is the most convenient work of the kind that has yet appeared; and we must add, the very beautiful manner in which it is "got up," is so creditable to the country as to be flattering to our national pride.—*American Medical Journal.*

---

## *SHARPEY (WILLIAM), M.D.,* and *QUAIN (JONES & RICHARD).*

### HUMAN ANATOMY.

Revised, with Notes and Additions, by JOSEPH LEIDY, M. D., Professor of Anatomy in the University of Pennsylvania. Complete in two large octavo volumes, of about 1300 pages, with 511 illustrations; extra cloth, $6 00.

The very low price of this standard work, and its completeness in all departments of the subject, should command for it a place in the library of all anatomical students.

---

## *HODGES, (RICHARD M.), M.D.,*

*Late Demonstrator of Anatomy in the Medical Department of Harvard University.*

### PRACTICAL DISSECTIONS.

Second Edition, thoroughly revised. In one neat royal 12mo. volume, half-bound, $2 00.

The object of this work is to present to the anatomical student a clear and concise description of that which he is expected to observe in an ordinary course of dissections. The author has endeavored to omit unnecessary details, and to present the subject in the form which many years' experience has shown him to be the most convenient and intelligible to the student. In the revision of the present edition, he has sedulously labored to render the volume more worthy of the favor with which it has heretofore been received.

## WILSON (*ERASMUS*), *F.R.S.*

### A SYSTEM OF HUMAN ANATOMY, General and Special.

Edited by W. H. GOBRECHT, M. D., Professor of General and Surgical Anatomy in the Medical College of Ohio. Illustrated with three hundred and ninety-seven engravings on wood. In one large and handsome octavo volume, of over 600 large pages; extra cloth, $4 00; leather, $5 00.

The publisher trusts that the well-earned reputation of this long-established favorite will be more than maintained by the present edition. Besides a very thorough revision by the author, it has been most carefully examined by the editor, and the efforts of both have been directed to introducing everything which increased experience in its use has suggested as desirable to render it a complete text-book for those seeking to obtain or to renew an acquaintance with Human Anatomy. The amount of additions which it has thus received may be estimated from the fact that the present edition contains over one-fourth more matter than the last, rendering a smaller type and an enlarged page requisite to keep the volume within a convenient size. The author has not only thus added largely to the work, but he has also made alterations throughout, wherever there appeared the opportunity of improving the arrangement or style, so as to present every fact in its most appropriate manner, and to render the whole as clear and intelligible as possible. The editor has exercised the utmost caution to obtain entire accuracy in the text, and has largely increased the number of illustrations, of which there are about one hundred and fifty more in this edition than in the last, thus bringing distinctly before the eye of the student everything of interest or importance.

## HEATH (*CHRISTOPHER*), *F. R. C. S.*,

*Teacher of Operative Surgery in University College, London.*

### PRACTICAL ANATOMY: A Manual of Dissections.

From the Second revised and improved London edition. Edited, with additions, by W. W. KEEN, M. D., Lecturer on Pathological Anatomy in the Jefferson Medical College, Philadelphia. In one handsome royal 12mo. volume of 578 pages, with 247 illustrations. Extra cloth, $3 50; leather, $4 00. (*Just Issued.*)

Dr. Keen, the American editor of this work, in his preface, says: "In presenting this American edition of 'Heath's Practical Anatomy,' I feel that I have been instrumental in supplying a want long felt for *a real* dissector's manual," and this assertion of its editor we deem is fully justified, after an examination of its contents, for it is really an excellent work. Indeed, we do not hesitate to say, the best of its class with which we are acquainted; resembling Wilson in terse and clear description, excelling most of the so-called practical anatomical dissectors in the scope of the subject and practical selected matter. . . . In reading this work, one is forcibly impressed with the great pains the author takes to impress the subject upon the mind of the student. He is full of rare and pleasing little devices to aid memory in maintaining its hold upon the slippery slopes of anatomy. —*St. Louis Med. and Surg. Journal*, Mar. 10, 1871.

It appears to us certain that, as a guide in dissection, and as a work containing facts of anatomy in brief and easily understood form, this manual is complete. This work contains, also, very perfect illustrations of parts which can thus be more easily understood and studied; in this respect it compares favorably with works of much greater pretension.

Such manuals of anatomy are always favorite works with medical students. We would earnestly recommend this one to their attention; it has excellences which make it valuable as a guide in dissecting, as well as in studying anatomy.—*Buffalo Medical and Surgical Journal*, Jan. 1871.

The first English edition was issued about six years ago, and was favorably received not only on account of the great reputation of its author, but also from its great value and excellence as a guide-book to the practical anatomist. The American edition has undergone some alterations and additions which will no doubt enhance its value materially. The convenience of the student has been carefully consulted in the arrangement of the text, and the directions given for the prosecution of certain dissections will be duly appreciated.—*Canada Lancet*, Feb. 1871.

This is an excellent Dissector's Manual; one which is not merely a descriptive manual of anatomy, but a guide to the student at the dissecting table, enabling him, though a beginner, to prosecute his work intelligently, and without assistance. The American editor has made many valuable alterations and additions to the original work.—*Am. Journ. of Obstetrics*, Feb. 1871.

## MACLISE (*JOSEPH*).

### SURGICAL ANATOMY.

By JOSEPH MACLISE, Surgeon. In one volume, very large imperial quarto; with 68 large and splendid plates, drawn in the best style and beautifully colored, containing 190 figures, many of them the size of life; together with copious explanatory letter-press. Strongly and handsomely bound in extra cloth. Price $14 00.

As no complete work of the kind has heretofore been published in the English language, the present volume will supply a want long felt in this country of an accurate and comprehensive Atlas of Surgical Anatomy, to which the student and practitioner can at all times refer to ascertain the exact relative positions of the various portions of the human frame towards each other and to the surface, as well as their abnormal deviations. Notwithstanding the large size, beauty and finish of the very numerous illustrations, it will be observed that the price is so low as to place it within the reach of all members of the profession.

We know of no work on surgical anatomy which can compete with it.—*Lancet.*

The work of Maclise on surgical anatomy is of the highest value. In some respects it is the best publication of its kind we have seen, and is worthy of a place in the library of any medical man, while the student could scarcely make a better investment than this.—*The Western Journal of Medicine and Surgery.*

No such lithographic illustrations of surgical regions have hitherto, we think, been given. While the operator is shown every vessel and nerve where an operation is contemplated, the exact anatomist is refreshed by those clear and distinct dissections, which every one must appreciate who has a particle of enthusiasm. The English medical press has quite exhausted the words of praise, in recommending this admirable treatise. Those who have any curiosity to gratify, in reference to the perfectibility of the lithographic art in delineating the complex mechanism of the human body, are invited to examine our specimen copy. If anything will induce surgeons and students to patronize a book of such rare value and everyday importance to them, it will be a survey of the artistical skill exhibited in these fac-similes of nature.—Boston Med. and Surg. Journal.

---

***HORNER'S SPECIAL ANATOMY AND HISTOLOGY. Eighth edition, extensively revised and modified.*** \ In 2 vols. 8vo., of over 1000 pages, with more than 300 wood-cuts; extra cloth, $6 00.

## *MARSHALL (JOHN), F. R. S.,*

*Professor of Surgery in University College, London, &c.*

### OUTLINES OF PHYSIOLOGY, HUMAN AND COMPARATIVE.

With Additions by FRANCIS GURNEY SMITH, M. D., Professor of the Institutes of Medicine in the University of Pennsylvania, &c. With numerous illustrations. In one large and handsome octavo volume, of 1026 pages, extra cloth, $6 50; leather, raised bands. $7 50.

In fact, in every respect, Mr. Marshall has presented us with a most complete, reliable, and scientific work, and we feel that it is worthy our warmest commendation.—*St. Louis Med. Reporter*, Jan. 1869.

This is an elaborate and carefully prepared digest of human and comparative physiology, designed for the use of general readers, but more especially serviceable to the student of medicine. Its style is concise, clear, and scholarly; its order perspicuous and exact, and its range of topics extended. The author and his American editor have been careful to bring to the illustration of the subject the important discoveries of modern science in the various cognate departments of investigation. This is especially visible in the variety of interesting information derived from the departments of chemistry and physics. The great amount and variety of matter contained in the work is strikingly illustrated by turning over the copious index, covering twenty-four closely printed pages in double columns.—*Silliman's Journal*, Jan. 1869.

We doubt if there is in the English language any compend of physiology more useful to the student than this work.—*St. Louis Med. and Surg. Journal*, Jan. 1869.

It quite fulfils, in our opinion, the author's design of making it truly *educational* in its character—which is, perhaps, the highest commendation that can be asked.—*Am. Journ. Med. Sciences*, Jan. 1869.

We may now congratulate him on having completed the latest as well as the best summary of modern physiological science, both human and comparative, with which we are acquainted. To speak of this work in the terms ordinarily used on such occasions would not be agreeable to ourselves, and would fail to do justice to its author. To write such a book requires a varied and wide range of knowledge, considerable power of analysis, correct judgment, skill in arrangement, and conscientious spirit. It must have entailed great labor, but now that the task has been fulfilled, the book will prove not only invaluable to the student of medicine and surgery, but serviceable to all candidates in natural science examinations, to teachers in schools, and to the lover of nature generally. In conclusion, we can only express the conviction that the merits of the work will command for it that success which the ability and vast labor displayed in its production so well deserve.—*London Lancet*, Feb. 22, 1868.

If the possession of knowledge, and peculiar aptitude and skill in expounding it, qualify a man to write an educational work, Mr. Marshall's treatise might be reviewed favorably without even opening the covers. There are few, if any, more accomplished anatomists and physiologists than the distinguished professor of surgery at University College; and he has long enjoyed the highest reputation as a teacher of physiology, possessing remarkable powers of clear exposition and graphic illustration. We have rarely the pleasure of being able to recommend a text-book so unreservedly as this.—*British Med. Journal*, Jan. 25, 1868.

---

## *CARPENTER (WILLIAM B.), M. D., F. R. S.,*

*Examiner in Physiology and Comparative Anatomy in the University of London.*

### PRINCIPLES OF HUMAN PHYSIOLOGY; with their chief applications to Psychology, Pathology, Therapeutics, Hygiene and Forensic Medicine.

A new American from the last and revised London edition. With nearly three hundred illustrations. Edited, with additions, by FRANCIS GURNEY SMITH, M. D., Professor of the Institutes of Medicine in the University of Pennsylvania, &c. In one very large and beautiful octavo volume, of about 900 large pages, handsomely printed; extra cloth, $5 50; leather, raised bands, $6 50.

With Dr. Smith, we confidently believe "that the present will more than sustain the enviable reputation already attained by former editions, of being one of the fullest and most complete treatises on the subject in the English language." We know of none from the pages of which a satisfactory knowledge of the physiology of the human organism can be as well obtained, none better adapted for the use of such as take up the study of physiology in its reference to the institutes and practice of medicine.—*Am. Jour. Med. Sciences.*

We doubt not it is destined to retain a strong hold on public favor, and remain the favorite text-book in our colleges.—*Virginia Medical Journal.*

The above is the title of what is emphatically *the* great work on physiology; and we are conscious that it would be a useless effort to attempt to add anything to the reputation of this invaluable work, and can only say to all with whom our opinion has any influence, that it is our *authority*.—*Atlanta Med. Journal.*

---

## *BY THE SAME AUTHOR.*

### PRINCIPLES OF COMPARATIVE PHYSIOLOGY.

New American, from the Fourth and Revised London Edition. In one large and handsome octavo volume, with over three hundred beautiful illustrations Pp. 752. Extra cloth, $5 00.

As a complete and condensed treatise on its extended and important subject, this work becomes a necessity to students of natural science, while the very low price at which it is offered places it within the reach of all.

---

## *KIRKES (WILLIAM SENHOUSE), M. D.*

### A MANUAL OF PHYSIOLOGY.

A new American from the third and improved London edition. With two hundred illustrations. In one large and handsome royal 12mo. volume. Pp. 586. Extra cloth, $2 25; leather, $2 75.

It is at once convenient in size, comprehensive in design, and concise in statement, and altogether well adapted for the purpose designed.—*St. Louis Med. and Surg. Journal.*

The physiological reader will find it a most excellent guide in the study of physiology in its most advanced and perfect form. The author has shown himself capable of giving details sufficiently ample in a condensed and concentrated shape, on a science in which it is necessary at once to be correct and not lengthened.—Edinburgh Med. and Surg. Journal.

**DALTON (J. C.), M. D.,**
*Professor of Physiology in the College of Physicians and Surgeons, New York, &c.*

### A TREATISE ON HUMAN PHYSIOLOGY.

Designed for the use of Students and Practitioners of Medicine. Fifth edition, revised, with nearly three hundred illustrations on wood. In one very beautiful octavo volume, of over 700 pages, extra cloth, $5 25; leather, $6 25. (*Now Ready.*)

*Preface to the Fifth Edition.*

In preparing the present edition of this work, the general plan and arrangement of the previous editions have been retained, so far as they have been found useful and adapted to the purposes of a text-book for students of medicine. The incessant advance of all the natural and physical sciences, never more active than within the last five years, has furnished many valuable aids to the special investigations of the physiologist; and the progress of physiological research, during the same period, has required a careful revision of the entire work, and the modification or rearrangement of many of its parts. At this day, nothing is regarded as of any value in natural science which is not based upon direct and intelligible observation or experiment; and, accordingly, the discussion of doubtful or theoretical questions has been avoided, as a general rule, in the present volume, while new facts, from whatever source, if fully established, have been added and incorporated with the results of previous investigation. A number of new illustrations have been introduced, and a few of the older ones, which seemed to be no longer useful, have been omitted. In all the changes and additions thus made, it has been the aim of the writer to make the book, in its present form, a faithful exponent of the actual conditions of physiological science.

NEW YORK, October, 1871.

In this, the standard text-book on Physiology, all that is needed to maintain the favor with which it is regarded by the profession, is the author's assurance that it has been thoroughly revised and brought up to a level with the advanced science of the day. To accomplish this has required some enlargement of the work, but no advance has been made in the price.

A few notices of previous editions are subjoined.

It is no disparagement of the many excellent works on physiology, published prior to that of Dalton, to say that none of them, either in plan of arrangement or clearness of execution, could be compared with his for the use of students or general practitioners of medicine. For this purpose his book has no equal in the English language.—*Western Journal of Medicine*, Nov. 1867.

A capital text-book in every way. We are, therefore, glad to see it in its fourth edition. It has already been examined at full length in these columns, so that we need not now further advert to it beyond remarking that both revision and enlargement have been most judicious.—*London Med. Times and Gazette*, Oct. 19, 1867.

No better proof of the value of this admirable work could be produced than the fact that it has already reached a fourth edition in the short space of eight years. Possessing in an eminent degree the merits of clearness and condensation, and being fully brought up to the present level of Physiology, it is undoubtedly one of the most reliable text-books upon this science that could be placed in the hands of the medical student.—*Am. Journal Med. Sciences*, Oct. 1867.

Prof. Dalton's work has such a well-established reputation that it does not stand in need of any recommendation. Ever since its first appearance it has become the highest authority in the English language; and that it is able to maintain the enviable position which it has taken, the rapid exhaustion of the different successive editions is sufficient evidence. The present edition, which is the fourth, has been thoroughly revised, and enlarged by the incorporation of all the many important advances which have lately been made in this rapidly progressing science. —*N. Y. Med. Record*, Oct. 15, 1867.

As it stands, we esteem it the very best of the physiological text-books, for the student, and the most concise reference and guide-book for the practitioner. —*N. Y. Med. Journal*, Oct. 1867.

The present edition of this now standard work fully sustains the high reputation of its accomplished author. It is not merely a reprint, but has been faithfully revised, and enriched by such additions as the progress of physiology has rendered desirable. Taken as a whole, it is unquestionably the most reliable and useful treatise on the subject that has been issued from the American press.—*Chicago Med. Journal*, Sept. 1867.

---

**DUNGLISON (ROBLEY), M. D.,**
*Professor of Institutes of Medicine in Jefferson Medical College, Philadelphia.*

### HUMAN PHYSIOLOGY.

Eighth edition. Thoroughly revised and extensively modified and enlarged, with five hundred and thirty-two illustrations. In two large and handsomely printed octavo volumes of about 1500 pages, extra cloth. $7 00.

---

**LEHMANN (C. G.).**

### PHYSIOLOGICAL CHEMISTRY.

Translated from the second edition by GEORGE E DAY, M. D., F. R. S., &c., edited by R. E. ROGERS, M. D., Professor of Chemistry in the Medical Department of the University of Pennsylvania, with illustrations selected from Funke's Atlas of Physiological Chemistry, and an Appendix of plates. Complete in two large and handsome octavo volumes, containing 1200 pages, with nearly two hundred illustrations, extra cloth. $6 00.

---

**BY THE SAME AUTHOR.**

### MANUAL OF CHEMICAL PHYSIOLOGY.

Translated from the German, with Notes and Additions, by J CHESTON MORRIS, M. D., with an Introductory Essay on Vital Force, by Professor SAMUEL JACKSON, M. D., of the University of Pennsylvania. With illustrations on wood. In one very handsome octavo volume of 336 pages. extra cloth. $2 25.

---

**TODD (ROBERT B.), M. D. F. R. S., and BOWMAN (W.), F. R. S.**

### THE PHYSIOLOGICAL ANATOMY AND PHYSIOLOGY OF MAN.

With about three hundred large and beautiful illustrations on wood. Complete in one large octavo volume of 950 pages, extra cloth. Price $4 75.

## ATTFIELD (*JOHN*), *Ph. D.*,

*Professor of Practical Chemistry to the Pharmaceutical Society of Great Britain, &c.*

### CHEMISTRY, GENERAL, MEDICAL, AND PHARMACEUTICAL;

including the Chemistry of the U. S. Pharmacopœia. A Manual of the General Principles of the Science, and their Application to Medicine and Pharmacy. From the Second and Enlarged English Edition, revised by the author. In one handsome royal 12mo. volume of about 550 pages; extra cloth, $2 75; leather, $3 25. (*Just Issued.*)

It contains a most admirable digest of what is specially needed by the medical student in all that relates to practical chemistry, and constitutes for him a sound and useful text-book on the subject. . . . We commend it to the notice of every medical, as well as pharmaceutical, student. We only regret that we had not the book to depend upon in working up the subject of practical and pharmaceutical chemistry for the University of London, for which it seems to us that it is exactly adapted. This is paying the book a high compliment.—*The Lancet.*

Dr. Attfield's book is written in a clear and able manner; it is a work *sui generis* and without a rival; it will be welcomed, we think, by every reader of the 'Pharmacopœia,' and is quite as well suited for the medical student as for the pharmacist.—*The Chemical News*

A valuable guide to practical medical chemistry, and an admirable companion to the "British Pharmacopœia." It is rare to find so many qualities combined, and quite curious to note how much valuable information finds a mutual interdependence.—*Medical Times and Gazette*

It is almost the only book from which the medical student can work up the pharmacopœial chemistry required at his examinations.—*The Pharmaceutical Journal.*

At page 330 of the current volume of this journal, we remarked that "there is a sad dearth of [medical] students' text-books in chemistry." Dr. Attfield's volume, just published, is rather a new book than a second edition of his previous work, and more nearly realizes our ideal than any book we have before seen on the subject.—*The British Medical Journal.*

The introduction of new matter has not destroyed the original character of the work, as a treatise on pharmaceutical and medical chemistry, but has simply extended the foundations of these special departments of the science.—*The Chemist and Druggist.*

We believe that this manual has been already adopted as the class-book by many of the professors in the public schools throughout the United Kingdom. . . . In pharmaceutical chemistry applied to the pharmacopœia, we know of no rival. It is, therefore, particularly suited to the medical student.—*The Medical Press and Circular.*

It in every way fulfils the intention of the author. We can strongly recommend it as a most complete manual of chemistry, alike useful to the physician and pharmaceutist.—*Canada Med. Journ.*, Nov. '70.

## ODLING (*WILLIAM*),

*Lecturer on Chemistry, at St. Bartholomew's Hospital, &c.*

### A COURSE OF PRACTICAL CHEMISTRY, arranged for the Use

of Medical Students. With Illustrations. From the Fourth and Revised London Edition. In one neat royal 12mo. volume, extra cloth. $2. (*Lately Issued.*)

As a work for the practitioner it cannot be excelled It is written plainly and concisely, and gives in a very small compass the information required by the busy practitioner. It is essentially a work for the physician, and no one who purchases it will ever regret the outlay In addition to all that is usually given in connection with inorganic chemistry, there are most valuable contributions to toxicology, animal and organic chemistry, etc. The portions devoted to a discussion of these subjects are very excellent. In no work can the physician find more that is valuable and reliable in regard to urine, bile, milk, bone, urinary calculi, tissue composition, etc. The work is small, reasonable in price, and well published.—*Richmond and Louisville Med. Journal*, Dec. 1869.

## BOWMAN (*JOHN E.*), *M. D.*

### PRACTICAL HANDBOOK OF MEDICAL CHEMISTRY. Edited

by C. L. BLOXAM, Professor of Practical Chemistry in King's College, London. Fifth American, from the fourth and revised English Edition. In one neat volume, royal 12mo., pp. 351, with numerous illustrations, extra cloth. $2 25. (*Just Issued.*)

The fourth edition of this invaluable text-book of Medical Chemistry was published in England in October of the last year. The Editor has brought down the Handbook to that date, introducing, as far as was compatible with the necessary conciseness of such a work, all the valuable discoveries in the science which have come to light since the previous edition was printed. The work is indispensable to every student of medicine or enlightened practitioner. It is printed in clear type, and the illustrations are numerous and intelligible.—*Boston Med. and Surg. Journal.*

## BY THE SAME AUTHOR.

### INTRODUCTION TO PRACTICAL CHEMISTRY, INCLUDING

ANALYSIS. Fifth American, from the fifth and revised London edition. With numerous illustrations. In one neat vol., royal 12mo., extra cloth. $2 25. (*Just Issued.*)

One of the most complete manuals that has for a long time been given to the medical student.—*Athenæum.*

We regard it as realizing almost everything to be desired in an introduction to Practical Chemistry.

It is by far the best adapted for the Chemical student of any that has yet fallen in our way.—*British and Foreign Medico-Chirurgical Review.*

The best introductory work on the subject with which we are acquainted.—*Edinburgh Monthly Jour.*

## GRAHAM (*THOMAS*), *F.R.S.*

### THE ELEMENTS OF INORGANIC CHEMISTRY, including the

Applications of the Science in the Arts. New and much enlarged edition, by HENRY WATTS and ROBERT BRIDGES, M. D. Complete in one large and handsome octavo volume, of over 800 very large pages, with two hundred and thirty-two wood-cuts, extra cloth. $5 50.

**KNAPP'S TECHNOLOGY**; or Chemistry Applied to the Arts, and to Manufactures. With American additions, by Prof. WALTER R. JOHNSON. In two very handsome octavo volumes, with 500 wood engravings, extra cloth, $6 00.

## *FOWNES (GEORGE), Ph. D.*

A MANUAL OF ELEMENTARY CHEMISTRY; Theoretical and Practical. With one hundred and ninety-seven illustrations. A new American, from the tenth and revised London edition. Edited by ROBERT BRIDGES, M. D. In one large royal 12mo. volume, of about 850 pp., extra cloth, $2 75; leather, $3 25. (*Just Issued.*)

Some years having elapsed since the appearance of the last American edition, and several revisions having been made of the work in England during the interval, it will be found very greatly altered, and enlarged by about two hundred and fifty pages, containing nearly one half more matter than before. The editors, Mr. Watts and Dr. Bence Jones, have labored sedulously to render it worthy in all respects of the very remarkable favor which it has thus far enjoyed, by incorporating in it all the most recent investigations and discoveries, in so far as is compatible with its design as an elementary text-book. While its distinguishing characteristics have been preserved, various portions have been rewritten, and especial pains have been taken with the department of Organic Chemistry in which late researches have accumulated so many new facts and have enabled the subject to be systematized and rendered intelligible in a manner formerly impossible. As only a few months have elapsed since the work thus passed through the hands of Mr. Watts and Dr. Bence Jones, but little has remained to be done by the American editor. Such additions as seemed advisable have however been made, and especial care has been taken to secure, by the closest scrutiny, the accuracy so essential in a work of this nature.

Thus fully brought up to a level with the latest advances of science, and presented at a price within the reach of all, it is hoped that the work will maintain its position as the favorite text-book of the medical student.

This work is so well known that it seems almost superfluous for us to speak about it. It has been a favorite text-book with medical students for years, and its popularity has in no respect diminished. Whenever we have been consulted by medical students, as has frequently occurred, what treatise on chemistry they should procure, we have always recommended Fownes', for we regarded it as the best. There is no work that combines so many excellences. It is of convenient size, not prolix, of plain perspicuous diction, contains all the most recent discoveries, and is of moderate price.—*Cincinnati Med. Repertory*, Aug. 1869.

Large additions have been made, especially in the department of organic chemistry, and we know of no other work that has greater claims on the physician, pharmaceutist, or student, than this. We cheerfully recommend it as the best text-book on elementary chemistry, and bespeak for it the careful attention of students of pharmacy.—*Chicago Pharmacist*, Aug. 1869.

The American reprint of the tenth revised and corrected English edition is now issued, and represents the present condition of the science. No comments are necessary to insure it a favorable reception at the hands of practitioners and students.—*Boston Med. and Surg. Journal*, Aug. 12, 1869.

It will continue, as heretofore, to hold the first rank as a text-book for students of medicine.—*Chicago Med. Examiner*, Aug. 1869.

This work, long the recognized Manual of Chemistry, appears as a tenth edition, under the able editorship of Bence Jones and Henry Watts. The chapter on the General Principles of Chemical Philosophy, and the greater part of the organic chemistry, have been rewritten, and the whole work revised in accordance with the recent advances in chemical knowledge. It remains the standard text-book of chemistry.—*Dublin Quarterly Journal*, Feb. 1869.

There is probably not a student of chemistry in this country to whom the admirable manual of the late Professor Fownes is unknown. It has achieved a success which we believe is entirely without a parallel among scientific text-books in our language. This success has arisen from the fact that there is no English work on chemistry which combines so many excellences. Of convenient size, of attractive form, clear and concise in diction, well illustrated, and of moderate price, it would seem that every requisite for a student's hand-book has been attained. The ninth edition was published under the joint editorship of Dr. Bence Jones and Dr. Hofmann; the new one has been superintended through the press by Dr. Bence Jones and Mr. Henry Watts. It is not too much to say that it could not possibly have been in better hands. There is no one in England who can compare with Mr. Watts in experience as a compiler in chemical literature, and we have much pleasure in recording the fact that his reputation is well sustained by this, his last undertaking.—*The Chemical News*, Feb. 1869.

Here is a new edition which has been long watched for by eager teachers of chemistry. In its new garb, and under the editorship of Mr. Watts, it has resumed its old place as the most successful of text-books.—*Indian Medical Gazette*, Jan. 1, 1869.

## *BRANDE (WM. T.), D. C. L., and TAYLOR (ALFRED S.), M. D., F. R. S.*

CHEMISTRY. Second American edition, thoroughly revised by Dr. TAYLOR. In one handsome 8vo. volume of 764 pages, extra cloth, $5 00; leather, $6 00.

### FROM DR. TAYLOR'S PREFACE.

"The revision of the second edition, in consequence of the death of my lamented colleague, has devolved entirely upon myself. Every chapter, and indeed every page, has been revised, and numerous additions made in all parts of the volume. These additions have been restricted chiefly to subjects having some practical interest, and they have been made as concise as possible, in order to keep the book within those limits which may retain for it the character of a Student's Manual."—*London*, June 29, 1867.

A book that has already so established a reputation, as has Brande and Taylor's Chemistry, can hardly need a notice, save to mention the additions and improvements of the edition. Doubtless the work will long remain a favorite text-book in the schools, as well as a convenient book of reference for all.—*N. Y. Medical Gazette*, Oct. 12, 1867.

For this reason we hail with delight the republication, in a form which will meet with general approval and command public attention, of this really valuable standard work on chemistry—more particularly as it has been adapted with such care to the wants of the general public. The well known scholarship of its authors, and their extensive researches for many years in *experimental* chemistry, have been long appreciated in the scientific world, but in this work they have been careful to give the largest possible amount of information with the most sparing use of technical terms and phraseology, so as to furnish the reader, "whether a student of medicine, or a man of the world, with a plain introduction to the science and practice of chemistry."—*Journal of Applied Chemistry*, Oct. 1867.

This second American edition of an excellent treatise on chemical science is not a mere republication from the English press, but is a revision and enlargement of the original, under the supervision of the surviving author, Dr. Taylor. The favorable opinion expressed on the publication of the former edition of this work is fully sustained by the present revision, in which Dr. T. has increased the size of the volume, by an addition of sixty-eight pages.—*Am. Journ. Med. Sciences*, Oct. 1867.

## PARRISH (EDWARD),

*Professor of Materia Medica in the Philadelphia College of Pharmacy.*

A TREATISE ON PHARMACY. Designed as a Text-Book for the Student, and as a Guide for the Physician and Pharmaceutist. With many Formulæ and Prescriptions. Third Edition, greatly improved. In one handsome octavo volume, of 850 pages, with several hundred illustrations, extra cloth. $5 00: leather, $6 00.

**The immense amount of practical information condensed in this volume may be estimated from the fact that the Index contains about 4700 items. Under the head of Acids there are 312 references; under Emplastrum, 36; Extracts, 159; Lozenges, 25; Mixtures, 55; Pills, 56; Syrups, 131; Tinctures, 138; Unguentum, 57, &c.**

We have examined this large volume with a good deal of care, and find that the author has completely exhausted the subject upon which he treats; a more complete work, we think, it would be impossible to find. To the student of pharmacy the work is indispensable; indeed, so far as we know, it is the only one of its kind in existence, and even to the physician or medical student who can spare five dollars to purchase it, we feel sure the practical information he will obtain will more than compensate him for the outlay.—*Canada Med. Journal*, Nov. 1864.

The medical student and the practising physician will find the volume of inestimable worth for study and reference.—*San Francisco Med. Press*, July, 1864.

When we say that this book is in some respects the best which has been published on the subject in the English language for a great many years, we do not wish it to be understood as very extravagant praise. In truth, it is not so much the best as the only book.—*The London Chemical News.*

An attempt to furnish anything like an analysis of Parrish's very valuable and elaborate *Treatise on Practical Pharmacy* would require more space than we have at our disposal. This, however, is not so much a matter of regret, inasmuch as it would be difficult to think of any point, however minute and apparently trivial, connected with the manipulation of pharmaceutic substances or appliances which has not been clearly and carefully discussed in this volume. Want of space prevents our enlarging further on this valuable work, and we must conclude by a simple expression of our hearty appreciation of its merits.—*Dublin Quarterly Jour. of Medical Science*, August, 1864.

## STILLÉ (ALFRED), M.D.,

*Professor of Theory and Practice of Medicine in the University of Penna.*

THERAPEUTICS AND MATERIA MEDICA; a Systematic Treatise on the Action and Uses of Medicinal Agents, including their Description and History. Third edition, revised and enlarged. In two large and handsome octavo volumes of about 1700 pages, extra cloth, $10; leather, $12.

Dr. Stillé's splendid work on therapeutics and materia medica.—*London Med. Times*, April 8, 1865.

Dr. Stillé stands to-day one of the best and most honored representatives at home and abroad, of American medicine; and these volumes, a library in themselves, a treasure-house for every studious physician, assure his fame even had he done nothing more.—*The Western Journal of Medicine*, Dec. 1868.

We regard this work as the best one on Materia Medica in the English language, and as such it deserves the favor it has received.—*Am. Journ. Medical Sciences*, July 1868.

We need not dwell on the merits of the third edition of this magnificently conceived work. It is the work on Materia Medica, in which Therapeutics are primarily considered—the mere natural history of drugs being briefly disposed of. To medical practitioners this is a very valuable conception. It is wonderful how much of the riches of the literature of Materia Medica has been condensed into this book. The references alone would make it worth possessing. But it is not a mere compilation. The writer exercises a good judgment of his own on the great doctrines and points of Therapeutics For purposes of practice, Stillé's book is almost unique as a repertory of information, empirical and scientific, on the actions and uses of medicines.—*London Lancet*, Oct. 31, 1868.

Through the former editions, the professional world is well acquainted with this work. At home and abroad its reputation as a standard treatise on Materia Medica is securely established It is second to no work on the subject in the English tongue, and, indeed, is decidedly superior, in some respects, to any other.—*Pacific Med. and Surg Journal*, July, 1868.

Stillé's Therapeutics is incomparably the best work on the subject.—*N. Y. Med. Gazette*, Sept. 26, 1868.

Dr. Stillé's work is becoming the best known of any of our treatises on Materia Medica. . . . One of the most valuable works in the language on the subjects of which it treats.—*N. Y. Med. Journal*, Oct. 1868.

The rapid exhaustion of two editions of Prof. Stillé's scholarly work, and the consequent necessity for a third edition, is sufficient evidence of the high estimate placed upon it by the profession. It is no exaggeration to say that there is no superior work upon the subject in the English language. The present edition is fully up to the most recent advance in the science and art of therapeutics.—*Leavenworth Medical Herald*, Aug. 1868.

The work of Prof. Stillé has rapidly taken a high place in professional esteem, and to say that a third edition is demanded and now appears before us, sufficiently attests the firm position this treatise has made for itself. As a work of great research, and scholarship, it is safe to say we have nothing superior. It is exceedingly full, and the busy practitioner will find ample suggestions upon almost every important point of therapeutics.—*Cincinnati Lancet*, Aug. 1868.

## GRIFFITH (ROBERT E.), M.D.

A UNIVERSAL FORMULARY, Containing the Methods of Preparing and Administering Officinal and other Medicines. The whole adapted to Physicians and Pharmaceutists. Second edition, thoroughly revised, with numerous additions, by ROBERT P. THOMAS, M.D., Professor of Materia Medica in the Philadelphia College of Pharmacy. In one large and handsome octavo volume of 650 pages, double-columns. Extra cloth, $4 00; leather, $5 00.

**Three complete and extended Indexes render the work especially adapted for immediate consultation. One, of DISEASES AND THEIR REMEDIES, presents under the head of each disease the remedial agents which have been usefully exhibited in it, with reference to the formulæ containing *them*—while another of PHARMACEUTICAL and BOTANICAL NAMES, and a very thorough GENERAL INDEX afford the means of obtaining at once any information desired. The Formulary itself is arranged alphabetically, under the heads of the leading constituents of the prescriptions.**

We know of none in our language, or any other, so comprehensive in its details.—London Lancet.

One of the most complete works of the kind in any language.—Edinburgh Med. Journal.

We are not cognizant of the existence of a parallel work.—London Med. Gazette.

### *PEREIRA (JONATHAN), M.D., F.R.S. and L.S.*

**MATERIA MEDICA AND THERAPEUTICS; being an Abridgment of the late Dr. Pereira's Elements of Materia Medica, arranged in conformity with the British Pharmacopœia, and adapted to the use of Medical Practitioners, Chemists and Druggists, Medical and Pharmaceutical Students, &c. By F. J. FARRE, M.D., Senior Physician to St. Bartholomew's Hospital, and London Editor of the British Pharmacopœia; assisted by ROBERT BENTLEY, M.R.C.S., Professor of Materia Medica and Botany to the Pharmaceutical Society of Great Britain; and by ROBERT WARINGTON, F.R.S., Chemical Operator to the Society of Apothecaries. With numerous additions and references to the United States Pharmacopœia, by HORATIO C. WOOD, M.D., Professor of Botany in the University of Pennsylvania. In one large and handsome octavo volume of 1040 closely printed pages, with 236 illustrations, extra cloth, $7 00; leather, raised bands, $8 00.**

The task of the American editor has evidently been no sinecure, for not only has he given to us all that is contained in the abridgment useful for our purposes, but by a careful and judicious embodiment of over a hundred new remedies has increased the size of the former work fully one-third, besides adding many new illustrations, some of which are original. We unhesitatingly say that by so doing he has proportionately increased the value, not only of the condensed edition, but has extended the applicability of the great original, and has placed his medical countrymen under lasting obligations to him. The American physician now has all that is needed in the shape of a complete treatise on materia medica, and the medical student has a text-book which, for practical utility and intrinsic worth, stands unparalleled. Although of considerable size, it is none too large for the purposes for which it has been intended, and every medical man should, in justice to himself, spare a place for it upon his book-shelf, resting assured that the more he consults it the better he will be satisfied of its excellence.—*N. Y. Med. Record*, Nov. 15, 1866.

It will fill a place which no other work can occupy in the library of the physician, student, and apothecary.—*Boston Med. and Surg. Journal*, Nov. 8, 1866.

Of the many works on Materia Medica which have appeared since the issuing of the British Pharmacopœia, none will be more acceptable to the student and practitioner than the present. Pereira's Materia Medica had long ago asserted for itself the position of being the most complete work on the subject in the English language. But its very completeness stood in the way of its success. Except in the way of reference, or to those who made a special study of Materia Medica, Dr. Pereira's work was too full, and its perusal required an amount of time which few had at their disposal. Dr. Farre has very judiciously availed himself of the opportunity of the publication of the new Pharmacopœia, by bringing out an abridged edition of the great work. This edition of Pereira is by no means a mere abridged re-issue, but contains many improvements, both in the descriptive and therapeutical departments. We can recommend it as a very excellent and reliable text-book.—*Edinburgh Med. Journal*, February, 1866.

The reader cannot fail to be impressed, at a glance, with the exceeding value of this work as a compend of nearly all useful knowledge on the materia medica. We are greatly indebted to Professor Wood for his adaptation of it to our meridian. Without his emendations and additions it would lose much of its value to the American student. With them it is an American book.—*Pacific Medical and Surgical Journal*, December, 1866.

### *ELLIS (BENJAMIN), M.D.*

**THE MEDICAL FORMULARY: being a Collection of Prescriptions derived from the writings and practice of many of the most eminent physicians of America and Europe. Together with the usual Dietetic Preparations and Antidotes for Poisons. The whole accompanied with a few brief Pharmaceutic and Medical Observations. Twelfth edition, carefully revised and much improved by ALBERT H. SMITH, M.D. In one volume 8vo. of 376 pages, extra cloth, $3 00. (*Lately Published.*)**

**This work has remained for some time out of print, owing to the anxious care with which the Editor has sought to render the present edition worthy a continuance of the very remarkable favor which has carried the volume to the unusual honor of a TWELFTH EDITION. He has sedulously endeavored to introduce in it all new preparations and combinations deserving of confidence, besides adding two new classes, Antemetics and Disinfectants, with brief references to the inhalation of atomized fluids, the nasal douche of Thudichum, suggestions upon the method of hypodermic injection, the administration of anæsthetics, &c. &c. To accommodate these numerous additions, he has omitted much which the advance of science has rendered obsolete or of minor importance, notwithstanding which the volume has been increased by more than thirty pages. A new feature will be found in a copious Index of Diseases and their remedies, which cannot but increase the value of the work as a suggestive book of reference for the working practitioner. Every precaution has been taken to secure the typographical accuracy so necessary in a work of this nature, and it is hoped that the new edition will fully maintain the position which "ELLIS' FORMULARY" has long occupied.**

### *CARSON (JOSEPH), M.D.,*

*Professor of Materia Medica and Pharmacy in the University of Pennsylvania, &c.*

**SYNOPSIS OF THE COURSE OF LECTURES ON MATERIA MEDICA AND PHARMACY, delivered in the University of Pennsylvania. With three Lectures on the Modus Operandi of Medicines. Fourth and revised edition, extra cloth, $3 00.**

**DUNGLISON'S NEW REMEDIES, WITH FORMULÆ FOR THEIR PREPARATION AND ADMINISTRATION. Seventh edition, with extensive additions. One vol. 8vo., pp. 770; extra cloth. $4 00.**

**ROYLE'S MATERIA MEDICA AND THERAPEUTICS. Edited by JOSEPH CARSON, M. D. With ninety-eight illustrations. 1 vol. 8vo., pp. 700, extra cloth. $3 00.**

***CHRISTISON'S DISPENSATORY.* With copious *additions, and 213 large* wood-engravings. By R EGLESFELD GRIFFITH, M.D. One vol. 8vo., pp. 1000; extra cloth. $4 00.**

**CARPENTER'S PRIZE ESSAY ON THE USE OF ALCOHOLIC LIQUORS IN HEALTH AND DISEASE. New edition, with a Preface by D. F. CONDIE, M.D., and explanations of scientific words. In one neat 12mo. volume, pp. 178, extra cloth. 60 cents.**

**DE JONGH ON THE THREE KINDS OF COD-LIVER OIL, with their Chemical and Therapeutic Properties. 1 vol. 12mo., cloth. 75 cents.**

## *GREEN (T. HENRY), M.D.,*

*Lecturer on Pathology and Morbid Anatomy at Charing-Cross Hospital Medical School.*

**PATHOLOGY AND MORBID ANATOMY.** With numerous Illustrations on Wood. In one very handsome octavo volume of over 250 pages, extra cloth, $2 50. (*Just Ready.*)

The scope and object of this volume can be gathered from the following condensed

### SUMMARY OF CONTENTS.

Introduction. Chapter I. The "Cell." II. Nutrition Arrested. III. Nutrition Impaired. IV. Fatty Degeneration. V. Mucoid and Colloid Degeneration. VI. Fatty Infiltration. VII. Amyloid Degeneration. VIII. Calcareous Degeneration. IX. Pigmentary Degeneration. X. Nutrition Increased. XI. New Formations. XII. The Fibromata. XIII. The Sarcomata. XIV. The Gummata. XV. The Myxomata. XVI. The Lipomata. XVII. The Enchondromata. XVIII. The Osteomata. XIX. The Lymphomata. XX. Tubercle. XXI. The Papillomata. XXII. The Adenomata. XXIII. The Carcinomata. XXIV. The Myomata, Neuromata, and Angeomata. XXV. Cysts. XXVI. Inflammation. XXVII. Inflammation of Non-Vascular Tissues. XXVIII. Inflammation of Vascular Connective Tissues. XXIX. Inflammation of Bloodvessels and Heart. XXX. Inflammation of Lymphatic Structures. XXXI. Inflammation of Mucous Membranes. XXXII. Inflammation of Serous Membranes. XXXIII. Inflammation of the Liver. XXXIV. Inflammation of the Kidney. XXXV. Inflammation of the Lungs. XXXVI. Inflammation of Brain and Spinal Cord. XXXVII. Changes in the Blood and Circulation. XXXVIII. Thrombosis. XXXIX. Embolism.

We have been very much pleased by our perusal of this little volume. It is the only one of the kind with which we are acquainted, and practitioners as well as students will find it a very useful guide; for the information is up to the day, well and compactly arranged, without being at all scanty.—*London Lancet*, Oct. 7, 1871.

## *GROSS (SAMUEL D.), M. D.,*

*Professor of Surgery in the Jefferson Medical College of Philadelphia.*

**ELEMENTS OF PATHOLOGICAL ANATOMY.** Third edition, thoroughly revised and greatly improved. In one large and very handsome octavo volume of nearly 800 pages, with about three hundred and fifty beautiful illustrations, of which a large number are from original drawings; extra cloth. $4 00.

## *JONES (C. HANDFIELD), F.R.S., and SIEVEKING (ED. H.), M.D.,*

*Assistant Physicians and Lecturers in St. Mary's Hospital.*

**A MANUAL OF PATHOLOGICAL ANATOMY.** First American edition, revised. With three hundred and ninety-seven handsome wood engravings. In one large and beautifully printed octavo volume of nearly 750 pages, extra cloth, $3 50.

## *BARCLAY (A. W.), M. D.*

**A MANUAL OF MEDICAL DIAGNOSIS;** being an Analysis of the Signs and Symptoms of Disease. Third American from the second and revised London edition. In one neat octavo volume of 451 pages, extra cloth. $3 50.

## *WILLIAMS (CHARLES J. B.), M.D.,*

*Professor of Clinical Medicine in University College, London.*

**PRINCIPLES OF MEDICINE.** An Elementary View of the Causes, Nature, Treatment, Diagnosis, and Prognosis of Disease; with brief remarks on Hygienics, or the preservation of health. A new American, from the third and revised London edition. In one octavo volume of about 500 pages, extra cloth. $3 50.

**GLUGE'S ATLAS OF PATHOLOGICAL HISTOLOGY.** Translated, with Notes and Additions, by JOSEPH LEIDY, M. D. In one volume, very large imperial quarto, with 320 copper-plate figures, plain and colored, extra cloth. $4 00.

**SIMON'S GENERAL PATHOLOGY,** as conducive to the Establishment of Rational Principles for the Prevention and Cure of Disease. In one octavo volume of 212 pages, extra cloth. $1 25.

**SOLLY ON THE HUMAN BRAIN;** its Structure, Physiology, and Diseases. From the Second and much enlarged London edition. In one octavo volume 500 pages, with 120 wood-cuts; extra cloth. $2 50.

**LA ROCHE ON YELLOW FEVER,** considered in its Historical, Pathological, Etiological, and Therapeutical Relations. In two large and handsome octavo volumes, of nearly 1500 pages, extra cloth, $7 00.

**HOLLAND'S MEDICAL NOTES AND REFLECTIONS.** 1 vol. 8vo., pp. 500, extra cloth. $3 50

**WHAT TO OBSERVE AT THE BEDSIDE AND AFTER DEATH IN MEDICAL CASES.** Published under the authority of the London Society for Medical Observation. From the second London edition. 1 vol. royal 12mo., extra cloth. $1 00.

**LAYCOCK'S LECTURES ON THE PRINCIPLES AND METHODS OF MEDICAL OBSERVATION AND RESEARCH.** For the use of advanced students and junior practitioners. In one very neat royal 12mo. volume, extra cloth. $1 00.

## *DUNGLISON, FORBES, TWEEDIE, AND CONOLLY.*

**THE CYCLOPÆDIA OF PRACTICAL MEDICINE:** comprising Treatises on the Nature and Treatment of Diseases, Materia Medica and Therapeutics, Diseases of Women and Children, Medical Jurisprudence, &c. &c. In four large super-royal octavo volumes, of 3254 double-columned pages, strongly and handsomely bound in leather, $15; extra cloth, $11.

⁂ This work contains no less than four hundred and eighteen distinct treatises, contributed by sixty-eight distinguished physicians.

## *FLINT (AUSTIN), M.D.,*

*Professor of the Principles and Practice of Medicine in Bellevue Med. College, N. Y.*

**A TREATISE ON THE PRINCIPLES AND PRACTICE OF MEDICINE; designed for the use of Students and Practitioners of Medicine. Third edition, revised and enlarged. In one large and closely printed octavo volume of 1002 pages; handsome extra cloth, $6 00; or strongly bound in leather, with raised bands, $7 00. (*Lately Published.*)**

**By common consent of the English and American medical press, this work has been assigned to the highest position as a complete and compendious text-book on the most advanced condition of medical science. At the very moderate price at which it is offered it will be found one of the cheapest volumes now before the profession.**

Admirable and unequalled.—*Western Journal of Medicine*, Nov. 1869.

Dr. Flint's work, though claiming no higher title than that of a text-book, is really more. He is a man of large clinical experience, and his book is full of such masterly descriptions of disease as can only be drawn by a man intimately acquainted with their various forms. It is not so long since we had the pleasure of reviewing his first edition, and we recognize a great improvement, especially in the general part of the work. It is a work which we can cordially recommend to our readers as fully abreast of the science of the day.—*Edinburgh Med. Journal*, Oct. '69.

One of the best works of the kind for the practitioner, and the most convenient of all for the student.—*Am. Journ. Med. Sciences*, Jan. 1869.

This work, which stands pre-eminently as the advance standard of medical science up to the present time in the practice of medicine, has for its author one who is well and widely known as one of the leading practitioners of this continent. In fact, it is seldom that any work is ever issued from the press more deserving of universal recommendation.—*Dominion Med. Journal*, May, 1869.

The third edition of this most excellent book scarcely needs any commendation from us. The volume, as it stands now, is really a marvel: first of all, it is excellently printed and bound—and we encounter that luxury of America, the ready-cut pages, which the Yankees are 'cute enough to insist upon—nor are these by any means trifles; but the contents of the book are astonishing. Not only is it wonderful that any one man can have grasped in his mind the whole scope of medicine with that vigor which Dr. Flint shows, but the condensed yet clear way in which this is done is a perfect literary triumph. Dr. Flint is pre-eminently one of the strong men, whose right to do this kind of thing is well admitted; and we say no more than the truth when we affirm that he is very nearly the only living man that could do it with such results as the volume before us.—*The London Practitioner*, March, 1869.

This is in some respects the best text-book of medicine in our language, and it is highly appreciated on the other side of the Atlantic, inasmuch as the first edition was exhausted in a few months. The second edition was little more than a reprint, but the present has, as the author says, been thoroughly revised. Much valuable matter has been added, and by making the type smaller, the bulk of the volume is not much increased. The weak point in many American works is pathology, but Dr. Flint has taken peculiar pains on this point, greatly to the value of the book.—*London Med. Times and Gazette*, Feb. 6, 1869.

Published in 1866, this valuable book of Dr. Flint's has in two years exhausted two editions, and now we gladly announce a third. We say we gladly announce it, because we are proud of it as a national representative work of not only American, but of cosmopolitan medicine. In it the practice of medicine is young and philosophical, based on reason and common sense, and as such, we hope it will be at the right hand of every practitioner of this vast continent.—*California Medical Gazette*, March, 1869.

Considering the large number of valuable works in the practice of medicine, already before the profession, the marked favor with which this has been received, necessitating a third edition in the short space of two years, indicates unmistakably that it is a work of more than ordinary excellence, and must be accepted as evidence that it has largely fulfilled the object for which the author intended it. A marked feature in the work, and one which particularly adapts it for the use of students as a text-book, and certainly renders it none the less valuable to the busy practitioner as a work of reference, is brevity and simplicity. The present edition has been thoroughly revised, and much new matter incorporated, derived, as the author informs us, both from his own clinical studies, and from the latest contributions to medical literature, thus bringing it fully up with the most recent advances of the science, and greatly enhancing its practical utility; while, by a slight modification of its typographical arrangement, the additions have been accommodated without materially increasing its bulk.—*St Louis Med. Archives*, Feb. 1869.

If there be among our readers any who are not familiar with the treatise before us, we shall do them a service in persuading them to repair their omission forthwith. Combining to a rare degree the highest scientific attainments with the most practical common sense, and the closest habits of observation, the author has given us a volume which not only sets forth the results of the latest investigations of other laborers, but contains more original views than any other single work upon this well-worn theme within our knowledge.—*N. Y. Med. Gazette*, Feb. 27, 1869.

---

**BARLOW'S MANUAL OF THE PRACTICE OF MEDICINE. With Additions by D. F. CONDIE, M. D. 1 vol. 8vo., pp. 600, cloth. $2 50.**

**TODD'S CLINICAL LECTURES ON CERTAIN ACUTE DISEASES. In one neat octavo volume, of 320 pages, extra cloth. $2 50.**

---

## *PAVY (F. W.), M. D., F. R. S.,*

*Senior Asst. Physician to and Lecturer on Physiology, at Guy's Hospital, &c.*

**A TREATISE ON THE FUNCTION OF DIGESTION; its Disorders and their Treatment. From the second London edition. In one handsome volume, small octavo, extra cloth, $2 00. (*Lately Published.*)**

The work before us is one which deserves a wide circulation. We know of no better guide to the study of digestion and its disorders.—*St. Louis Med. and Surg. Journal*, July 10, 1869.

A thoroughly good book, being a careful systematic treatise, and sufficiently exhaustive for all practical purposes.—*Leavenworth Med. Herald*, July, 1869.

A very valuable work on the subject of which it treats. Small, yet it is full of valuable information.—*Cincinnati Med. Repertory*, June, 1869.

---

## *BRINTON (WILLIAM), M. D., F. R. S.*

**LECTURES ON THE DISEASES OF THE STOMACH; with an Introduction on its Anatomy and Physiology. From the second and enlarged London edition. With illustrations on wood. In one handsome octavo volume of about 300 pages, extra cloth. $3 25.**

## *HARTSHORNE (HENRY), M.D.,*

*Professor of Hygiene in the University of Pennsylvania.*

### ESSENTIALS OF THE PRINCIPLES AND PRACTICE OF MEDICINE.

A handy-book for Students and Practitioners. Third edition, revised and improved. In one handsome royal 12mo. volume of 487 pages, clearly printed on small type, cloth, $2 38; half bound, $2 63. (*Now Ready.*)

The very remarkable favor which has been bestowed upon this work, as manifested in the exhaustion of two large editions within four years, shows that it has successfully supplied a want felt by both student and practitioner of a volume which at a moderate price and in a convenient size should afford a clear and compact view of the most modern teachings in medical practice. In preparing the work for a third edition, the author has sought to maintain its character by very numerous additions, bringing it fully up to the science of the day, but so concisely framed that the size of the volume is increased only by thirty or forty pages. The extent of the new information thus introduced may be estimated by the fact that there have been two hundred and sixty separate additions made to the text, containing references to one hundred and eighty new authors.

This little epitome of medical knowledge has already been noticed by us. It is a vade mecum of value, including in a short space most of what is essential in the science and practice of medicine. The third edition is well up to the present day in the modern methods of treatment, and in the use of newly discovered drugs.—*Boston Med. and Surg. Journal*, Oct. 19, 1871.

Certainly very few volumes contain so much precise information within so small a compass.—*N. Y. Med. Journal*, Nov. 1871.

The diseases are conveniently classified; symptoms, causation, diagnosis, prognosis, and treatment are carefully considered, the whole being marked by briefness, but clearness of expression. Over 250 formulas are appended, intended as examples merely, not as guides, for unthinking practitioners. A complete index facilitates the use of this little volume, in which all important remedies lately introduced, such as chloral hydrate and carbolic acid, have received their full share of attention.—*Am. Journ. of Pharm.*, Nov. 1871.

It is an epitome of the whole science and practice of medicine, and will be found most valuable to the practitioner for easy reference, and especially to the student in attendance upon lectures, whose time is too much occupied with many studies, to consult the larger works. Such a work must always be in great demand.—*Cincinnati Med. Repertory*, Nov. 1871.

---

## *WATSON (THOMAS), M. D., &c.*

### LECTURES ON THE PRINCIPLES AND PRACTICE OF PHYSIC.

Delivered at King's College, London. A new American, from the Fifth revised and enlarged English edition. Edited, with additions, by HENRY HARTSHORNE, M.D., Professor of Hygiene in the University of Pennsylvania. In two large and handsome octavo volumes. (*Shortly.*)

With the assistance of Professor George Johnson, his successor in the chair of Practice of Medicine in King's College, the author has thoroughly revised this work, and has sought to bring it on a level with the most advanced condition of the subject. As he himself remarks: "Considering the rapid advance of medical science during the last fourteen years, the present edition would be worthless, if it did not differ much from the last"—but in the extensive alterations and additions that have been introduced, the effort of the author has been to retain the lucid and colloquial style of the lecture-room, which has made the work so deservedly popular with all classes of the profession. Notwithstanding these changes, there are some subjects on which the American reader might reasonably expect more detailed information than has been thought requisite in England, and these deficiencies the editor has endeavored to supply.

The large size to which the work has grown seems to render it necessary to print it in two volumes, in place of one, as in the last American edition. It is therefore presented in that shape, handsomely printed, at a very reasonable price, and it is hoped that it will fully maintain the position everywhere hitherto accorded to it, of the standard and classical representative of English practical medicine.

At length, after many months of expectation, we have the satisfaction of finding ourselves this week in possession of a revised and enlarged edition of Sir Thomas Watson's celebrated Lectures. It is a subject for congratulation and for thankfulness that Sir Thomas Watson, during a period of comparative leisure, after a long, laborious, and most honorable professional career, while retaining full possession of his high mental faculties, should have employed the opportunity to submit his Lectures to a more thorough revision than was possible during the earlier and busier period of his life. Carefully passing in review some of the most intricate and important pathological and practical questions, the results of his clear insight and his calm judgment are now recorded for the benefit of mankind, in language which, for precision, vigor, and classical elegance, has rarely been equalled, and never surpassed. The revision has evidently been most carefully done, and the results appear in almost every page.—*Brit. Med. Journ.*, Oct. 14, 1871.

---

## *CHAMBERS (T. K.), M. D.,*

*Consulting Physician to St. Mary's Hospital, London, &c.*

### THE INDIGESTIONS; or, Diseases of the Digestive Organs Functionally Treated.

Third and revised Edition. In one handsome octavo volume of 383 pages, extra cloth. $3 00. (*Lately Published.*)

So very large a proportion of the patients applying to every general practitioner suffer from some form of indigestion, that whatever aids him in their management directly "puts money in his purse," and indirectly does more than anything else to advance his reputation with the public. From this purely material point of view, setting aside its higher claims to merit, we know of no more desirable acquisition to a physician's library than the book before us. He who should commit its contents to his memory would find its price an investment of capital that returned him a most usurious rate of interest.—*N. Y. Medical Gazette*, Jan 26, 1871.

---

## *BY THE SAME AUTHOR. (Just Ready.)*

### RESTORATIVE MEDICINE.

An Harveian Annual Oration, delivered at the Royal College of Physicians, London, on June 24, 1871. With Two Sequels. In one very handsome volume, small 12mo., extra cloth, $1 00.

### *FLINT (AUSTIN), M. D.,*

*Professor of the Principles and Practice of Medicine in Bellevue Hospital Med. College, N. Y.*

A PRACTICAL TREATISE ON THE DIAGNOSIS, PATHOLOGY, AND TREATMENT OF DISEASES OF THE HEART. Second revised and enlarged edition. In one octavo volume of 550 pages, with a plate, extra cloth, $4. (*Just Issued.*)

**The author has sedulously improved the opportunity afforded him of revising this work. Portions of it have been rewritten, and the whole brought up to a level with the most advanced condition of science. It must therefore continue to maintain its position as the standard treatise on the subject.**

Dr. Flint chose a difficult subject for his researches, and has shown remarkable powers of observation and reflection, as well as great industry, in his treatment of it. His book must be considered the fullest and clearest practical treatise on those subjects, and should be in the hands of all practitioners and students. It is a credit to American medical literature. —*Amer. Journ. of the Med. Sciences*, July, 1860.

We question the fact of any recent American author in our profession being more extensively known, or more deservedly esteemed in this country than Dr. Flint. We willingly acknowledge his success, more particularly in the volume on diseases of the heart, in making an extended personal clinical study available for purposes of illustration, in connection with cases which have been reported by other trustworthy observers.—*Brit. and For. Med.-Chirurg. Review.*

In regard to the merits of the work, we have no hesitation in pronouncing it full, accurate, and judicious. Considering the present state of science, such a work was much needed. It should be in the hands of every practitioner.—*Chicago Med. Journ.*

With more than pleasure do we hail the advent of this work, for it fills a wide gap on the list of text-books for our schools, and is, for the practitioner, the most valuable practical work of its kind.—*N. O. Med. News.*

---

### *BY THE SAME AUTHOR.*

A PRACTICAL TREATISE ON THE PHYSICAL EXPLORATION OF THE CHEST AND THE DIAGNOSIS OF DISEASES AFFECTING THE RESPIRATORY ORGANS. Second and revised edition. In one handsome octavo volume of 595 pages, extra cloth, $4 50.

Dr. Flint's treatise is one of the most trustworthy guides which he can consult. The style is clear and distinct, and is also concise, being free from that tendency to over-refinement and unnecessary minuteness which characterizes many works on the same subject.—*Dublin Medical Press*, Feb. 6, 1867.

The chapter on Phthisis is replete with interest; and his remarks on the diagnosis, especially in the early stages, are remarkable for their acumen and great practical value. Dr. Flint's style is clear and elegant, and the tone of freshness and originality which pervades his whole work lend an additional force to its thoroughly practical character, which cannot fail to obtain for it a place as a standard work on diseases of the respiratory system.—*London Lancet*, Jan. 19, 1867.

This is an admirable book. Excellent in detail and execution, nothing better could be desired by the practitioner. Dr. Flint enriches his subject with much solid and not a little original observation.—*Ranking's Abstract*, Jan. 1867.

---

### *FULLER (HENRY WILLIAM), M. D.,*

*Physician to St. George's Hospital, London.*

ON DISEASES OF THE LUNGS AND AIR-PASSAGES. Their Pathology, Physical Diagnosis, Symptoms, and Treatment. From the second and revised English edition. In one handsome octavo volume of about 500 pages, extra cloth, $3 50.

Dr. Fuller's work on diseases of the chest was so favorably received, that to many who did not know the extent of his engagements, it was a matter of wonder that it should be allowed to remain three years out of print. Determined, however, to improve it, Dr. Fuller would not consent to a mere reprint, and accordingly we have what might be with perfect justice styled an entirely new work from his pen, the portion of the work treating of the heart and great vessels being excluded. Nevertheless, this volume is of almost equal size with the first.—*London Medical Times and Gazette*, July 20, 1867.

---

### *WILLIAMS (C. J. B.), M.D.,*

*Senior Consulting Physician to the Hospital for Consumption, Brompton, and*

### *WILLIAMS (CHARLES T.), M.D.,*

*Physician to the Hospital for Consumption.*

PULMONARY CONSUMPTION; Its Nature, Varieties, and Treatment. With an Analysis of One Thousand cases to exemplify its duration. In one neat octavo volume of about 350 pages, extra cloth. (*Just Ready.*) $2 50.

He can still speak from a more enormous experience, and a closer study of the morbid processes involved in tuberculosis, than most living men. He owed it to himself, and to the importance of the subject, to embody his views in a separate work, and we are glad that he has accomplished this duty. After all, the grand teaching which Dr Williams has for the profession is to be found in his therapeutical chapters, and in the history of individual cases extended, by dint of care, over ten, twenty, thirty, and even forty years.—*London Lancet*, Oct. 21, 1871.

His results are more favorable than those of any previous author; but probably there is no malady, the treatment of which has been so much improved within the last twenty years as pulmonary consumption. To ourselves, Dr. Williams's chapters on Treatment are amongst the most valuable and attractive in the book, and would alone render it a standard work of reference. In conclusion, we would record our opinion that Dr. Williams's great reputation is fully maintained by this book. It is undoubtedly one of the most valuable works in the language upon any special disease.—*Lond. Med. Times and Gaz.*, Nov. 4, 1871.

---

LA ROCHE ON PNEUMONIA. 1 vol. 8vo., extra cloth, of 500 pages. Price $3 00.

BUCKLER ON FIBRO-BRONCHITIS AND RHEUMATIC PNEUMONIA. 1 vol. 8vo. $1 25.

FISKE FUND PRIZE ESSAYS ON CONSUMPTION. 1 vol 8vo,, extra cloth, $1 00.

SMITH ON CONSUMPTION; ITS EARLY AND REMEDIABLE STAGES. 1 vol. 8vo , pp. 254. $2 25.

SALTER ON ASTHMA. 1 vol. 8vo. $2 50.

WALSHE ON THE DISEASES OF THE HEART AND GREAT VESSELS. Third American edition. In 1 vol. 8vo., 420 pp , cloth. $3 00.

*ROBERTS (WILLIAM), M. D.,*
*Lecturer on Medicine in the Manchester School of Medicine, &c.*

**A PRACTICAL TREATISE ON URINARY AND RENAL DISEASES, including Urinary Deposits. Illustrated by numerous cases and engravings. Second Edition, Revised. In one very handsome octavo volume. (*Preparing.*)**

*BASHAM (W. R.), M. D.,*
*Senior Physician to the Westminster Hospital, &c.*

**RENAL DISEASES: a Clinical Guide to their Diagnosis and Treatment. With illustrations. In one neat royal 12mo. volume of 304 pages. $2 00. (*Just Issued.*)**

The chapters on diagnosis and treatment are very good, and the student and young practitioner will find them full of valuable practical hints. The third part, on the urine, is excellent, and we cordially recommend its perusal. The author has arranged his matter in a somewhat novel, and, we think, useful form. Here everything can be easily found, and, what is more important, easily read, for all the dry details of larger books here acquire a new interest from the author's arrangement. This part of the book is full of good work.—*Brit. and For. Medico-Chirurgical Review*, July, 1870.

The easy descriptions and compact modes of statement render the book pleasing and convenient.—*Am. Journ. Med. Sciences*, July, 1870.

A book that we believe will be found a valuable assistant to the practitioner and guide to the student —*Baltimore Med. Journal*, July, 1870.

The treatise of Dr. Basham differs from the rest in its special adaptation to clinical study, and its condensed and almost aphorismal style, which makes it easily read and easily understood. Besides, the author expresses some new views, which are well worthy of consideration. The volume is a valuable addition to this department of knowledge.—*Pacific Med. and Surg. Journal*, July, 1870.

**MORLAND ON RETENTION IN THE BLOOD OF THE ELEMENTS OF THE URINARY SECRETION. 1 vol. 8vo., extra cloth. 75 cents.**

*JONES (C. HANDFIELD), M. D.,*
*Physician to St. Mary's Hospital, &c.*

**CLINICAL OBSERVATIONS ON FUNCTIONAL NERVOUS DISORDERS. Second American Edition. In one handsome octavo volume of 348 pages, extra cloth, $3 25.**

Taken as a whole, the work before us furnishes a short but reliable account of the pathology and treatment of a class of very common but certainly highly obscure disorders. The advanced student will find it a rich mine of valuable facts, while the medical practitioner will derive from it many a suggestive hint to aid him in the diagnosis of "nervous cases," and in determining the true indications for their amelioration or cure.—*Amer. Journ. Med. Sci.*, Jan. 1867.

We must cordially recommend it to the profession of this country as supplying, in a great measure, a deficiency which exists in the medical literature of the English language.—*New York Med. Journ.*, April, 1867.

The volume is a most admirable one—full of hints and practical suggestions.—*Canada Med. Journal*, April, 1867.

*ESSAYS ON NERVOUS DISEASES.* (*Now Ready.*)

**ON DISEASES OF THE SPINAL COLUMN AND OF THE NERVES. By C. B. RADCLIFF, M. D., JOHN NETTEN RADCLIFF, J. WARBURTON BEGBIE, M. D., FRANCIS E. AINSTIE, M. D., and J. RUSSELL REYNOLDS, M. D. 1 vol. 8vo., extra cloth, $1 50.**

This volume, which has been passing through the Library Department of the "MEDICAL NEWS" for 1870, consists of a series of essays from "Reynolds' System of Medicine" by gentlemen who have paid especial attention to the several affections of the nervous system.

*SLADE (D. D.), M.D.*

**DIPHTHERIA; its Nature and Treatment, with an account of the History of its Prevalence in various Countries. Second and revised edition. In one neat royal 12mo. volume, extra cloth. $1 25.**

*HUDSON (A.), M. D., M. R. I. A.,*
*Physician to the Meath Hospital.*

**LECTURES ON THE STUDY OF FEVER. In one vol. 8vo., extra Cloth, $2 50.**

As an admirable summary of the present state of our knowledge concerning fever, the work will be as welcome to the medical man in active practice as to the student. To the hard-worked practitioner who wishes to refresh his notions concerning fever, the book will prove most valuable. . . . We heartily commend his excellent volume to students and the profession at large.—*London Lancet*, June 22, 1867.

The truly philosophical lectures of Dr. Hudson add much to our previous knowledge, all of which they, moreover, analyze and condense. This well-conceived task has been admirably executed in the lectures, illustrative cases and quotations being arranged in an appendix to each. We regret that space forbids our quotation from the lectures on treatment, which are, in regard to research and judgment, most masterly, and evidently the result of extended and mature experience.—*British Medical Journal*, Feb. 22, 1868.

*LYONS (ROBERT D.), K. C. C.*

**A TREATISE ON FEVER; or, Selections from a Course of Lectures on Fever. Being part of a Course of Theory and Practice of Medicine. In one neat octavo volume, of 362 pages, extra cloth. $2 25.**

## *BUMSTEAD (FREEMAN J.), M.D.,*

*Professor of Venereal Diseases at the Col. of Phys. and Surg., New York, &c.*

**THE PATHOLOGY AND TREATMENT OF VENEREAL DISEASES.** Including the results of recent investigations upon the subject. Third edition, revised and enlarged, with illustrations. In one large and handsome octavo volume of over 700 pages, extra cloth, $5 00; leather, $6 00. (*Just Issued.*)

In preparing this standard work again for the press, the author has subjected it to a very thorough revision. Many portions have been rewritten, and much new matter added, in order to bring it completely on a level with the most advanced condition of syphilography, but by careful compression of the text of previous editions, the work has been increased by only sixty-four pages. The labor thus bestowed upon it, it is hoped, will insure for it a continuance of its position as a complete and trustworthy guide for the practitioner.

It is the most complete book with which we are acquainted in the language. The latest views of the best authorities are put forward, and the information is well arranged—a great point for the student, and still more for the practitioner. The subjects of visceral syphilis, syphilitic affections of the eyes, and the treatment of syphilis by repeated inoculations, are very fully discussed.—*London Lancet*, Jan. 7, 1871.

Dr. Bumstead's work is already so universally known as the best treatise in the English language on venereal diseases, that it may seem almost superfluous to say more of it than that a new edition has been issued. But the author's industry has rendered this new edition virtually a new work, and so merits as much special commendation as if its predecessors had not been published. As a thoroughly practical book on a class of diseases which form a large share of nearly every physician's practice, the volume before us is by far the best of which we have knowledge.—*N. Y. Medical Gazette*, Jan. 28, 1871.

It is rare in the history of medicine to find any one book which contains all that a practitioner needs to know; while the possessor of "Bumstead on Venereal" has no occasion to look outside of its covers for anything practical connected with the diagnosis, history, or treatment of these affections.—*N. Y. Medical Journal*, March, 1871.

---

## *CULLERIER (A.).* *and* *BUMSTEAD (FREEMAN J.),*

*Surgeon to the Hôpital du Midi.* — *Professor of Venereal Diseases in the College of Physicians and Surgeons, N. Y.*

**AN ATLAS OF VENEREAL DISEASES.** Translated and Edited by FREEMAN J. BUMSTEAD. In one large imperial 4to. volume of 328 pages, double-columns, with 26 plates, containing about 150 figures, beautifully colored, many of them the size of life; strongly bound in extra cloth, $17 00; also, in five parts, stout wrappers for mailing, at $3 per part. (*Lately Published.*)

Anticipating a very large sale for this work, it is offered at the very low price of THREE DOLLARS a Part, thus placing it within the reach of all who are interested in this department of practice. Gentlemen desiring early impressions of the plates would do well to order it without delay.

A specimen of the plates and text sent free by mail, on receipt of 25 cents.

We wish for once that our province was not restricted to methods of treatment, that we might say something of the exquisite colored plates in this volume. —*London Practitioner*, May, 1869.

As a whole, it teaches all that can be taught by means of plates and print.—*London Lancet*, March 13, 1869.

Superior to anything of the kind ever before issued on this continent.—*Canada Med. Journal*, March, '69.

The practitioner who desires to understand this branch of medicine thoroughly should obtain this, the most complete and best work ever published.—*Dominion Med. Journal*, May, 1869.

This is a work of master hands on both sides. M. Cullerier is scarcely second to, we think we may truly say is a peer of the illustrious and venerable Ricord, while in this country we do not hesitate to say that Dr. Bumstead, as an authority, is without a rival Assuring our readers that these illustrations tell the whole history of venereal disease, from its inception to its end, we do not know a single medical work, which for its kind is more *necessary* for them to have. —*California Med. Gazette*, March, 1869.

The most splendidly illustrated work in the language, and in our opinion far more useful than the French original.—*Am. Journ. Med. Sciences*, Jan. '69

The fifth and concluding number of this magnificent work has reached us, and we have no hesitation in saying that its illustrations surpass those of previous numbers.—*Boston Med. and Surg. Journal*, Jan. 14, 1869.

Other writers besides M. Cullerier have given us a good account of the diseases of which he treats, but no one has furnished us with such a complete series of illustrations of the venereal diseases. There is, however, an additional interest and value possessed by the volume before us; for it is an American reprint and translation of M. Cullerier's work, with incidental remarks by one of the most eminent American syphilographers, Mr. Bumstead. The letter-press is chiefly M Cullerier's, but every here and there a few lines or sentences are introduced by Mr. Bumstead; and, as M. Cullerier is a unicist, while Mr. Bumstead is a dualist, this method of treating the subject adds very much to its interest. By this means a liveliness is imparted to the volume which many other treatises sorely lack. It is like reading the report of a conversation or debate; for Mr. Bumstead often finds occasion to question M. Cullerier's statements or inferences, and this he does in a short and forcible way which helps to keep up the attention, and to make the book a very readable one.—*Brit. and For. Medico-Chir. Review*, July, 1869.

---

## *HILL (BERKELEY),*

*Surgeon to the Lock Hospital, London.*

**ON SYPHILIS AND LOCAL CONTAGIOUS DISORDERS.** In one handsome octavo volume: extra cloth, $3 25. (*Lately Published.*)

Bringing, as it does, the entire literature of the disease down to the present day, and giving with great ability the results of modern research, it is in every respect a most desirable work, and one which should find a place in the library of every surgeon.—*California Med. Gazette*, June, 1869.

Considering the scope of the book and the careful attention to the manifold aspects and details of its subject, it is wonderfully concise All these qualities render it an especially valuable book to the beginner, to whom we would most earnestly recommend its study; while it is no less useful to the practitioner.—*St. Louis Med. and Surg. Journal*, May, 1869.

The most convenient and ready book of reference we have met with.—*N. Y. Med. Record*, May 1, 1869.

Most admirably arranged for both student and practitioner, no other work on the subject equals it; it is more simple, more easily studied.—*Buffalo Med. and Surg. Journal*, March, 1869.

---

*LALLEMAND AND WILSON ON THE CAUSES, SYMPTOMS, AND TREATMENT OF SPERMATORRHŒA.* In one vol. 8vo., of about 400 pp., cloth, $2 75.

## WILSON (*ERASMUS*), *F.R.S.*

### ON DISEASES OF THE SKIN. With Illustrations on wood. Seventh American, from the sixth and enlarged English edition. In one large octavo volume of over 800 pages, $5. (*Lately Published.*)

### A SERIES OF PLATES ILLUSTRATING "WILSON ON DISEASES OF THE SKIN;" consisting of twenty beautifully executed plates, of which thirteen are exquisitely colored, presenting the Normal Anatomy and Pathology of the Skin, and embracing accurate representations of about one hundred varieties of disease, most of them the size of nature. Price, in extra cloth, $5 50.

**Also, the Text and Plates, bound in one handsome volume. Extra cloth, $10.**

**The industry and care with which the author has revised the present edition are shown by the fact that the volume has been enlarged by more than a hundred pages. In its present improved form it will therefore doubtless retain the position which it has acquired as a standard and classical authority, while at the same time it has additional claims on the attention of the profession as the latest and most complete work on the subject in the English language.**

Such a work as the one before us is a most capital and acceptable help. Mr. Wilson has long been held as high authority in this department of medicine, and his book on diseases of the skin has long been regarded as one of the best text-books extant on the subject. The present edition is carefully prepared, and brought up in its revision to the present time. In this edition we have also included the beautiful series of plates illustrative of the text, and in the last edition published separately. There are twenty of these plates, nearly all of them colored to nature, and exhibiting with great fidelity the various groups of diseases treated of in the body of the work.—*Cincinnati Lancet*, June, 1863.

No one treating skin diseases should be without a copy of this standard work.—*Canada Lancet*. August, 1863.

We can safely recommend it to the profession as the best work on the subject now in existence in the English language.—*Medical Times and Gazette*.

Mr. Wilson's volume is an excellent digest of the actual amount of knowledge of cutaneous diseases; it includes almost every fact or opinion of importance connected with the anatomy and pathology of the skin.—*British and Foreign Medical Review*.

These plates are very accurate, and are executed with an elegance and taste which are highly creditable to the artistic skill of the American artist who executed them.—*St. Louis Med. Journal*.

The drawings are very perfect, and the finish and coloring artistic and correct; the volume is an indispensable companion to the book it illustrates and completes.—*Charleston Medical Journal*.

*BY THE SAME AUTHOR.*

### THE STUDENT'S BOOK OF CUTANEOUS MEDICINE and DISEASES OF THE SKIN. In one very handsome royal 12mo. volume. $3 50. (*Lately Issued.*)

## NELIGAN (*J. MOORE*), *M.D., M.R.I.A.*

### A PRACTICAL TREATISE ON DISEASES OF THE SKIN. Fifth American, from the second and enlarged Dublin edition by T. W. Belcher, M. D. In one neat royal 12mo. volume of 462 pages, extra cloth. $2 25.

Fully equal to all the requirements of students and young practitioners. It is a work that has stood its ground, that was worthy the reputation of the author, and the high position of which has been maintained by its learned editor.—*Dublin Med. Press and Circular*, Nov. 17, 1869.

Of the remainder of the work we have nothing beyond unqualified commendation to offer. It is so far the most complete one of its size that has appeared, and for the student there can be none which can compare with it in practical value. All the late discoveries in Dermatology have been duly noticed, and their value justly estimated; in a word, the work is fully up to the times, and is thoroughly stocked with most valuable information.—*New York Med. Record*, Jan. 15, 1867.

This instructive little volume appears once more. Since the death of its distinguished author, the study of skin diseases has been considerably advanced, and the results of these investigations have been added by the present editor to the original work of Dr. Neligan. This, however, has not so far increased its bulk as to destroy its reputation as the most convenient manual of diseases of the skin that can be procured by the student.—*Chicago Med. Journal*, Dec. 1866.

*BY THE SAME AUTHOR.*

### ATLAS OF CUTANEOUS DISEASES. In one beautiful quarto volume, with exquisitely colored plates, &c., presenting about one hundred varieties of disease. Extra cloth, $5 50.

The diagnosis of eruptive disease, however, under all circumstances, is very difficult. Nevertheless, Dr. Neligan has certainly, "as far as possible," given a faithful and accurate representation of this class of diseases, and there can be no doubt that these plates will be of great use to the student and practitioner in drawing a diagnosis as to the class, order, and species to which the particular case may belong. While looking over the "Atlas" we have been induced to examine also the "Practical Treatise," and we are inclined to consider it a very superior work, combining accurate verbal description with sound views of the pathology and treatment of eruptive diseases.—*Glasgow Med. Journal*.

A compend which will very much aid the practitioner in this difficult branch of diagnosis. Taken with the beautiful plates of the Atlas, which are remarkable for their accuracy and beauty of coloring, it constitutes a very valuable addition to the library of a practical man.—*Buffalo Med. Journal*.

## HILLIER (*THOMAS*), *M.D.*,

*Physician to the Skin Department of University College Hospital, &c.*

### HAND-BOOK OF SKIN DISEASES, for Students and Practitioners. Second American Edition. In one royal 12mo. volume of 358 pp. With Illustrations. Extra cloth, $2 25. (*Just Issued.*)

We can conscientiously recommend it to the student; the style is clear and pleasant to read, the matter is good, and the descriptions of disease, with the modes of treatment recommended, are frequently illustrated with well-recorded cases.—*London Med. Times and Gazette*, April 1, 1863.

It is a concise, plain, practical treatise on the various diseases of the skin; just such a work, indeed, as was much needed, both by medical students and practitioners.—Chicago Medical Examiner, May, 1863.

## *SMITH (J. LEWIS), M. D.,*

*Professor of Morbid Anatomy in the Bellevue Hospital Med. College, N. Y.*

### A COMPLETE PRACTICAL TREATISE ON THE DISEASES OF CHILDREN.

Second Edition, revised and greatly enlarged. In one handsome octavo volume. (*Nearly Ready.*)

An original and valuable work.—*Glasgow Med. Journal*, Feb. 1871.

The excellence of this book is one explanation of our not having reviewed it sooner. Taking it up from time to time, we have been freshly interested in its various chapters, and so been led to defer writing our opinion of it. It is one of those works with which we are happily becoming familiar, as coming to us from time to time from across the Atlantic, which contain all that is good in European works of the same kind, together with much that is original, both in reflection and observation. It is astonishing how well the American writers succeed in gleaning, and yet giving a fresh character to their books. This work is an illustration, and pervading every chapter of it is a spirit of sound judgment and common sense, without which any work on any department of the practice of medicine is, to use the mildest word, defective. We are sorry that we cannot give further illustrations of the excellence of this book.—*London Lancet*, Sept. 4, 1869.

We have no work upon the Diseases of Infancy and Childhood which can compare with it.—*Buffalo Med. and Surg. Journal*, March, 1869.

The description of the pathology, symptoms, and treatment of the different diseases is excellent.—*Am. Med. Journal*, April, 1869.

---

## *CONDIE (D. FRANCIS), M. D.*

### A PRACTICAL TREATISE ON THE DISEASES OF CHILDREN.

Sixth edition, revised and augmented. In one large octavo volume of nearly 800 closely-printed pages, extra cloth, $5 25; leather, $6 25. (*Lately Issued.*)

The present edition, which is the sixth, is fully up to the times in the discussion of all those points in the pathology and treatment of infantile diseases which have been brought forward by the German and French teachers. As a whole, however, the work is the best American one that we have, and in its special adaptation to American practitioners it certainly has no equal.—*New York Med. Record*, March 2, 1868.

No other treatise on this subject is better adapted to the American physician Dr. Condie has long stood before his countrymen as one peculiarly pre-eminent in this department of medicine. His work has been so long a standard for practitioners and medical students that we do no more now than refer to the fact that it has reached its sixth edition. We are glad once more to refresh the impressions of our earlier days by wandering through its pages, and at the same time to be able to recommend it to the youngest members of the profession, as well as to those who have the older editions on their shelves.—*St. Louis Med. Reporter*, Feb. 15, 1868.

---

## *WEST (CHARLES), M. D.,*

*Physician to the Hospital for Sick Children, &c.*

### LECTURES ON THE DISEASES OF INFANCY AND CHILDHOOD.

Fourth American from the fifth revised and enlarged English edition. In one large and handsome octavo volume of 656 closely-printed pages. Extra cloth, $4 50; leather, $5 50.

Of all the English writers on the diseases of children, there is no one so entirely satisfactory to us as Dr. West. For years we have held his opinion as judicial, and have regarded him as one of the highest living authorities in the difficult department of medical science in which he is most widely known.—*Boston Med. and Surg. Journal*, April 26, 1866.

## *BY THE SAME AUTHOR. (Just Ready.)*

### ON SOME DISORDERS OF THE NERVOUS SYSTEM IN CHILDHOOD;

being the Lumleian Lectures delivered at the Royal College of Physicians of London, in March, 1871. In one volume, small 12mo., extra cloth, $1 00.

---

## *SMITH (EUSTACE), M. D.,*

*Physician to the Northwest London Free Dispensary for Sick Children.*

### A PRACTICAL TREATISE ON THE WASTING DISEASES OF INFANCY AND CHILDHOOD.

Second American, from the second revised and enlarged English edition. In one handsome octavo volume, extra cloth, $2 50. (*Now Ready.*)

This is in every way an admirable book. The modest title which the author has chosen for it scarcely conveys an adequate idea of the many subjects upon which it treats. Wasting is so constant an attendant upon the maladies of childhood, that a treatise upon the wasting diseases of children must necessarily embrace the consideration of many affections of which it is a symptom; and this is excellently well done by Dr. Smith. The book might fairly be described as a practical handbook of the common diseases of children, so numerous are the affections considered either collaterally or directly. We are acquainted with no safer guide to the treatment of children's diseases, and few works give the insight into the physiological and other peculiarities of children that Dr. Smith's book does.—*Brit. Med. Journ.*, April 8, 1871.

---

## *GUERSANT (P.), M. D.,*

*Honorary Surgeon to the Hospital for Sick Children, Paris.*

### SURGICAL DISEASES OF INFANTS AND CHILDREN.

Translated by R. J. DUNGLISON, M. D. (Publishing in the MEDICAL NEWS AND LIBRARY.)

As this work embodies the experience of twenty years' service in the great Children's Hospital of Paris, it can hardly fail to maintain the reputation of the valuable practical series of volumes which have been laid before the subscribers of the "AMERICAN JOURNAL OF THE MEDICAL SCIENCES." For terms, see p. 3.

---

*DEWEES ON THE PHYSICAL AND MEDICAL TREATMENT OF CHILDREN. Eleventh edition. 1 vol. 8vo. of 548 pages. $2 80.*

## *THOMAS (T. GAILLARD), M. D.*,

*Professor of Obstetrics, &c. in the College of Physicians and Surgeons, N. Y., &c.*

### A PRACTICAL TREATISE ON THE DISEASES OF WOMEN.

Third edition, revised and enlarged In one large and handsome octavo volume. (*Nearly Ready.*)

*From the Preface to the Second Edition.*

**In a science so rapidly progressive as that of medicine, the profession has a right to expect that, when its approbation of a work is manifested by a call for a new edition, the author should respond by giving to his book whatever of additional value may be derivable from more extended experience, maturer thought, and the opportunity for correction. Fully sensible of this, the author of the present volume has sought by a careful revision of the whole, and by the addition of a chapter on Chlorosis, to render his work more worthy of the favor with which it has been received.—NEW YORK, March, 1869.**

If the excellence of a work is to be judged by its rapid sale, this one must take precedence of all others upon the same, or kindred subjects, as evidenced in the short time from its first appearance, in which a new edition is called for, resulting, as we are informed, from the exhaustion of the previous large edition. We deem it scarcely necessery to recommend this work to physicians as it is now widely known, and most of them already possess it, or will certainly do so To students we unhesitatingly recommend it as the best text-book on diseases of females extant.—*St Louis Med. Reporter*, June, 1869.

Of all the army of books that have appeared of late years, on the diseases of the uterus and its appendages, we know of none that is so clear, comprehensive, and practical as this of Dr. Thomas', or one that we should more emphatically recommend to the young practitioner, as his guide.—*California Med. Gazette*, June, 1869.

If not the best work extant on the subject of which it treats, it is certainly second to none other. So short a time has elapsed since the medical press teemed with commendatory notices of the first edition, that it would be superfluous to give an extended review of what is now firmly established as *the* American text-book of Gynæcology.—*N. Y. Med. Gazette*, July 17, 1869.

This is a new and revised edition of a work which we recently noticed at some length, and earnestly commended to the favorable attention of our readers The fact that, in the short space of one year, this second edition makes its appearance, shows that the general judgment of the profession has largely confirmed the opinion we gave at that time.—*Cincinnati Lancet*, Aug. 1869.

It is so short a time since we gave a full review of the first edition of this book, that we deem it only necessary now to call attention to the second appearance of the work. Its success has been remarkable, and we can only congratulate the author on the brilliant reception his book has received.—*N. Y. Med. Journal*, April, 1869.

We regard this treatise as the one best adapted to serve as a text-book on gynæcology.—*St. Louis Med. and Surg. Journal*, May 10, 1869.

The whole work as it now stands is an absolute indispensable to any physician aspiring to treat the diseases of females with success, and according to the most fully accepted views of their ætiology and pathology.—*Leavenworth Medical Herald*, May, 1869.

We have seldom read a medical book in which we found so much to praise, and so little—we can hardly say to object to—to mention with qualified commendation. We had proposed a somewhat extended review with copious extracts, but we hardly know where we should have space for it. We therefore content ourselves with expressing the belief that every practitioner of medicine would do well to possess himself of the work.—*Boston Med. and Surg. Journal*, April 29, 1869.

The number of works published on diseases of women is large, not a few of which are very valuable. But of those which are the most valuable we do not regard the work of Dr. Thomas as second to any. Without being prolix, it treats of the disorders to which it is devoted fully, perspicuously, and satisfactorily. It will be found a treasury of knowledge to every physician who turns to its pages. We would like to make a number of quotations from the work of a practical bearing, but our space will not permit. The work should find a place in the libraries of all physicians.—*Cincinnati Med. Repertory*, May, 1869.

No one will be surprised to learn that the valuable, readable, and thoroughly practical book of Professor Thomas has so soon advanced to a second edition. Although very little time has necessarily been allowed our author for revision and improvement of the work, he has performed it exceedingly well. Aside from the numerous corrections which he has found necessary to make, he has added an admirable chapter on chlorosis, which of itself is worth the cost of the volume.—*N. Y. Med. Record*, May 15, 1869.

## *CHURCHILL (FLEETWOOD), M. D., M. R. I. A.*

### ESSAYS ON THE PUERPERAL FEVER, AND OTHER DISEASES PECULIAR TO WOMEN.

**Selected from the writings of British Authors previous to the close of the Eighteenth Century. In one neat octavo volume of about 450 pages, extra cloth. $2 50.**

## *ASHWELL (SAMUEL), M. D.*,

*Late Obstetric Physician and Lecturer at Guy's Hospital.*

### A PRACTICAL TREATISE ON THE DISEASES PECULIAR TO WOMEN.

**Illustrated by Cases derived from Hospital and Private Practice. Third American, from the Third and revised London edition. In one octavo volume, extra cloth, of 528 pages. $3 50.**

BIGBY ON THE CONSTITUTIONAL TREATMENT OF FEMALE DISEASES. In one neat royal 12mo volume, extra cloth, of about 250 pages. $1 00.

**DEWEES'S TREATISE ON THE DISEASES OF FEMALES. With illustrations. Eleventh Edition, with the Author's last improvements and corrections. In one octavo volume of 536 pages, with plates, extra cloth, $3 00.**

## *BARNES (ROBERT), M. D., F. R. C. P.*,

*Obstetric Physician to St. Thomas' Hospital, &c.*

### A PRACTICAL TREATISE ON THE DISEASES OF WOMEN.

**In one handsome octavo volume with illustrations. (Preparing.)**

### HODGE (HUGH L.), M.D.,

*Emeritus Professor of Obstetrics, &c., in the University of Pennsylvania.*

**ON DISEASES PECULIAR TO WOMEN; including Displacements** of the Uterus. With original illustrations. Second edition, revised and enlarged. In one beautifully printed octavo volume of 531 pages, extra cloth. $4 50. (*Lately Issued.*)

In the preparation of this edition the author has spared no pains to improve it with the results of his observation and study during the interval which has elapsed since the first appearance of the work. Considerable additions have thus been made to it, which have been partially accommodated by an enlargement in the size of the page, to avoid increasing unduly the bulk of the volume.

*From* PROF. W. H. BYFORD, *of the Rush Medical College, Chicago.*

The book bears the impress of a master hand, and must, as its predecessor, prove acceptable to the profession. In diseases of women Dr. Hodge has established a school of treatment that has become world-wide in fame.

Professor Hodge's work is truly an original one from beginning to end, consequently no one can peruse its pages without learning something new. The book, which is by no means a large one, is divided into two grand sections, so to speak: first, that treating of the nervous sympathies of the uterus, and, secondly, that which speaks of the mechanical treatment of displacements of that organ. He is disposed, as a non-believer in the frequency of inflammations of the uterus, to take strong ground against many of the highest authorities in this branch of medicine, and the arguments which he offers in support of his position are, to say the least, well put. Numerous woodcuts adorn this portion of the work, and add incalculably to the proper appreciation of the variously shaped instruments referred to by our author. As a contribution to the study of women's diseases, it is of great value, and is abundantly able to stand on its own merits.—*N. Y. Medical Record*, Sept. 15, 1868.

In this point of view, the treatise of Professor Hodge will be indispensable to every student in its department. The large, fair type and general perfection of workmanship will render it doubly welcome. —*Pacific Med. and Surg. Journal*, Oct. 1868.

### WEST (CHARLES), M.D.

**LECTURES ON THE DISEASES OF WOMEN. Third American,** from the Third London edition. In one neat octavo volume of about 550 pages, extra cloth. $3 75; leather, $4 75.

The reputation which this volume has acquired as a standard book of reference in its department, renders it only necessary to say that the present edition has received a careful revision at the hands of the author, resulting in a considerable increase of size. A few notices of previous editions are subjoined.

The manner of the author is excellent, his descriptions graphic and perspicuous, and his treatment up to the level of the time—clear, precise, definite, and marked by strong common sense.—*Chicago Med. Journal*, Dec. 1861.

We cannot too highly recommend this, the second edition of Dr West's excellent lectures on the diseases of females. We know of no other book on this subject from which we have derived as much pleasure and instruction. Every page gives evidence of the honest, earnest, and diligent searcher after truth. He is not the mere compiler of other men's ideas, but his lectures are the result of ten years' patient investigation in one of the widest fields for women's diseases—St. Bartholomew's Hospital. As a teacher, Dr. West is simple and earnest in his language, clear and comprehensive in his perceptions, and logical in his deductions.—*Cincinnati Lancet*, Jan. 1862.

We return the author our grateful thanks for the vast amount of instruction he has afforded us. His valuable treatise needs no eulogy on our part. His graphic diction and truthful pictures of disease all speak for themselves.—*Medico-Chirurg. Review.*

Most justly esteemed a standard work. . . . . It bears evidence of having been carefully revised, and is well worthy of the fame it has already obtained. —*Dub. Med. Quar. Jour.*

As a writer, Dr. West stands, in our opinion, second only to Watson, the "Macaulay of Medicine;" he possesses that happy faculty of clothing instruction in easy garments; combining pleasure with profit, he leads his pupils, in spite of the ancient proverb, along a royal road to learning. His work is one which will not satisfy the extreme on either side, but it is one that will please the great majority who are seeking truth, and one that will convince the student that he has committed himself to a candid, safe, and valuable guide.—*N. A. Med.-Chirurg Review.*

We must now conclude this hastily written sketch with the confident assurance to our readers that the work will well repay perusal. The conscientious, painstaking, practical physician is apparent on every page.—*N. Y. Journal of Medicine.*

We have to say of it, briefly and decidedly, that it is the best work on the subject in any language, and that it stamps Dr. West as the *facile princeps* of British obstetric authors.—*Edinburgh Med. Journal.*

We gladly recommend his lectures as in the highest degree instructive to all who are interested in obstetric practice.—*London. Lancet.*

We know of no treatise of the kind so complete, and yet so compact.—*Chicago Med. Journal.*

*BY THE SAME AUTHOR.*

**AN ENQUIRY INTO THE PATHOLOGICAL IMPORTANCE OF ULCERATION OF THE OS UTERI.** In one neat octavo volume, extra cloth. $1 25.

### MEIGS (CHARLES D.), M. D.,

*Late Professor of Obstetrics, &c. in Jefferson Medical College, Philadelphia.*

**WOMAN: HER DISEASES AND THEIR REMEDIES. A Series** of Lectures to his Class. Fourth and Improved edition. In one large and beautifully printed octavo volume of over 700 pages, extra cloth, $5 00; leather, $6 00.

*BY THE SAME AUTHOR.*

**ON THE NATURE, SIGNS, AND TREATMENT OF CHILDBED FEVER.** In a Series of Letters addressed to the Students of his Class. In one handsome octavo volume of 365 pages, extra cloth. $2 00.

### SIMPSON (SIR JAMES Y.), M.D.

**CLINICAL LECTURES ON THE DISEASES OF WOMEN. With** numerous illustrations. In one octavo volume of over 500 pages. Second edition, preparing.

## HODGE (HUGH L.), M.D.,

*Emeritus Professor of Midwifery, &c. in the University of Pennsylvania, &c.*

THE PRINCIPLES AND PRACTICE OF OBSTETRICS. Illustrated with large lithographic plates containing one hundred and fifty-nine figures from original photographs, and with numerous wood-cuts. In one large and beautifully printed quarto volume of 550 double-columned pages, strongly bound in extra cloth, $14.

The work of Dr. Hodge is something more than a simple presentation of his particular views in the department of Obstetrics; it is something more than an ordinary treatise on midwifery; it is, in fact, a cyclopædia of midwifery. He has aimed to embody in a single volume the whole science and art of Obstetrics. An elaborate text is combined with accurate and varied pictorial illustrations, so that no fact or principle is left unstated or unexplained.—*Am. Med. Times*, Sept. 3, 1864.

We should like to analyze the remainder of this excellent work, but already has this review extended beyond our limited space. We cannot conclude this notice without referring to the excellent finish of the work. In typography it is not to be excelled; the paper is superior to what is usually afforded by our American cousins, quite equal to the best of English books. The engravings and lithographs are most beautifully executed. The work recommends itself for its originality, and is in every way a most valuable addition to those on the subject of obstetrics.—*Canada Med. Journal*, Oct. 1864.

It is very large, profusely and elegantly illustrated, and is fitted to take its place near the works of great obstetricians. Of the American works on the subject it is decidedly the best.—*Edinb. Med. Jour.*, Dec. '64.

We have examined Professor Hodge's work with great satisfaction; every topic is elaborated most fully. The views of the author are comprehensive, and concisely stated. The rules of practice are judicious, and will enable the practitioner to meet every emergency of obstetric complication with confidence.—*Chicago Med. Journal*, Aug. 1864.

More time than we have had at our disposal since we received the great work of Dr. Hodge is necessary to do it justice. It is undoubtedly by far the most original, complete, and carefully composed treatise on the principles and practice of Obstetrics which has ever been issued from the American press.—*Pacific Med. and Surg. Journal*, July, 1864.

We have read Dr. Hodge's book with great pleasure, and have much satisfaction in expressing our commendation of it as a whole. It is certainly highly instructive, and in the main, we believe, correct. The great attention which the author has devoted to the mechanism of parturition, taken along with the conclusions at which he has arrived, point, we think, conclusively to the fact that, in Britain at least, the doctrines of Naegele have been too blindly received.—*Glasgow Med. Journal*, Oct. 1864.

⁂ Specimens of the plates and letter-press will be forwarded to any address, free by mail, on receipt of six cents in postage stamps.

## TANNER (THOMAS H.), M. D.

ON THE SIGNS AND DISEASES OF PREGNANCY. First American from the Second and Enlarged English Edition. With four colored plates and illustrations on wood. In one handsome octavo volume of about 500 pages, extra cloth, $4 25.

The very thorough revision the work has undergone has added greatly to its practical value, and increased materially its efficiency as a guide to the student and to the young practitioner.—*Am. Journ. Med. Sci.*, April, 1868.

With the immense variety of subjects treated of and the ground which they are made to cover, the impossibility of giving an extended review of this truly remarkable work must be apparent. We have not a single fault to find with it, and most heartily commend it to the careful study of every physician who would not only always be sure of his diagnosis of pregnancy, but always ready to treat all the numerous ailments that are, unfortunately for the civilized women of to-day, so commonly associated with the function.—*N. Y. Med. Record*, March 16, 1868.

We have much pleasure in calling the attention of our readers to the volume produced by Dr. Tanner, the second edition of a work that was, in its original state even, acceptable to the profession. We recommend obstetrical students, young and old, to have this volume in their collections. It contains not only a fair statement of the signs, symptoms, and diseases of pregnancy, but comprises in addition much interesting relative matter that is not to be found in any other work that we can name.—*Edinburgh Med. Journal*, Jan. 1868.

In its treatment of the signs and diseases of pregnancy it is the most complete book we know of, abounding on every page with matter valuable to the general practitioner.—*Cincinnati Med. Repertory*, March, 1868.

This is a most excellent work, and should be on the table or in the library of every practitioner.—*Humboldt Med. Archives*, Feb. 1868.

A valuable compendium, enriched by his own labors, of all that is known on the signs and diseases of pregnancy.—*St. Louis Med. Reporter*, Feb. 15, 1868.

## SWAYNE (JOSEPH GRIFFITHS), M. D.,

*Physician-Accoucheur to the British General Hospital, &c.*

OBSTETRIC APHORISMS FOR THE USE OF STUDENTS COMMENCING MIDWIFERY PRACTICE. From the Fourth and Revised London Edition, with Additions by E. R. HUTCHINS, M. D. With Illustrations. In one neat 12mo. volume. Extra cloth, $1 25. (*Lately Published.*)

It is really a capital little compendium of the subject, and we recommend young practitioners to buy it and carry it with them when called to attend cases of labor. They can while away the otherwise tedious hours of waiting, and thoroughly fix in their memories the most important practical suggestions it contains. The American editor has materially added by his notes and the concluding chapters to the completeness and general value of the book.—*Chicago Med. Journal*, Feb. 1870.

The manual before us contains in exceedingly small compass—small enough to carry in the pocket—about all there is of obstetrics, condensed into a nutshell of *Aphorisms*. The illustrations are well selected, and serve as excellent reminders of the conduct of labor—regular and difficult.—*Cincinnati Lancet*, April, '70.

This is a most admirable little work, and completely answers the purpose. It is not only valuable for young beginners, but no one who is not a proficient in the art of obstetrics should be without it, because it condenses all that is necessary to know for ordinary midwifery practice. We commend the book most favorably.—*St. Louis Med. and Surg. Journal*, Sept. 10, 1870.

A studied perusal of this little book has satisfied us of its eminently practical value. The object of the work, the author says, in his preface, is to give the student a few brief and practical directions respecting the management of ordinary cases of labor; and also to point out to him in extraordinary cases when and how he may act upon his own responsibility, and when he ought to send for assistance.—*N. Y. Medical Journal*, May, 1870.

## *MEIGS (CHARLES D.), M. D.,*

*Lately Professor of Obstetrics, &c., in the Jefferson Medical College, Philadelphia.*

**OBSTETRICS: THE SCIENCE AND THE ART.** Fifth edition, revised. With one hundred and thirty illustrations. In one beautifully printed octavo volume of 760 large pages. Extra cloth, $5 50; leather, $6 50.

It is to the student that our author has more particularly addressed himself; but to the practitioner we believe it would be equally serviceable as a book of reference. No work that we have met with so thoroughly details everything that falls to the lot of the accoucheur to perform. Every detail, no matter how minute or how trivial, has found a place.—*Canada Medical Journal*, July, 1867.

The original edition is already so extensively and favorably known to the profession that no recommendation is necessary; it is sufficient to say, the present edition is very much extended, improved, and perfected. Whilst the great practical talents and unlimited experience of the author render it a most valuable acquisition to the practitioner, it is so condensed as to constitute a most eligible and excellent text-book for the student.—*Southern Med. and Surg. Journal*, July, 1867.

## *RAMSBOTHAM (FRANCIS H.), M. D.*

**THE PRINCIPLES AND PRACTICE OF OBSTETRIC MEDICINE AND SURGERY**, in reference to the Process of Parturition. A new and enlarged edition, thoroughly revised by the author. With additions by W. V. KEATING, M. D., Professor of Obstetrics, &c., in the Jefferson Medical College, Philadelphia. In one large and handsome imperial octavo volume of 650 pages, strongly bound in leather, with raised bands; with sixty-four beautiful plates, and numerous wood-cuts in the text, containing in all nearly 200 large and beautiful figures. $7 00.

We will only add that the student will learn from it all he need to know, and the practitioner will find it, as a book of reference, surpassed by none other.—*Stethoscope.*

The character and merits of Dr. Ramsbotham's work are so well known and thoroughly established, that comment is unnecessary and praise superfluous. The illustrations, which are numerous and accurate, are executed in the highest style of art. We cannot too highly recommend the work to our readers.—*St. Louis Med. and Surg. Journal.*

To the physician's library it is indispensable, while to the student, as a text-book, from which to extract the material for laying the foundation of an education on obstetrical science, it has no superior.—*Ohio Med. and Surg. Journal.*

When we call to mind the toil we underwent in acquiring a knowledge of this subject, we cannot but envy the student of the present day the aid which this work will afford him.—*Am. Jour. of the Med. Sciences.*

## *CHURCHILL (FLEETWOOD), M. D., M. R. I. A.*

**ON THE THEORY AND PRACTICE OF MIDWIFERY.** A new American from the fourth revised and enlarged London edition. With notes and additions by D. FRANCIS CONDIE, M. D., author of a "Practical Treatise on the Diseases of Children," &c. With one hundred and ninety-four illustrations. In one very handsome octavo volume of nearly 700 large pages. Extra cloth, $4 00; leather, $5 00.

In adapting this standard favorite to the wants of the profession in the United States, the editor has endeavored to insert everything that his experience has shown him would be desirable for the American student, including a large number of illustrations. With the sanction of the author, he has added, in the form of an appendix, some chapters from a little "Manual for Midwives and Nurses," recently issued by Dr. Churchill, believing that the details there presented can hardly fail to prove of advantage to the junior practitioner. The result of all these additions is that the work now contains fully one-half more matter than the last American edition, with nearly one-half more illustrations; so that, notwithstanding the use of a smaller type, the volume contains almost two hundred pages more than before.

These additions render the work still more complete and acceptable than ever; and with the excellent style in which the publishers have presented this edition of Churchill, we can commend it to the profession with great cordiality and pleasure.—*Cincinnati Lancet.*

Few works on this branch of medical science are equal to it, certainly none excel it, whether in regard to theory or practice, and in one respect it is superior to all others, viz., in its statistical information, and therefore, on these grounds a most valuable work for the physician, student, or lecturer, all of whom will find in it the information which they are seeking.—*Brit. Am. Journal.*

The present treatise is very much enlarged and amplified beyond the previous editions but nothing has been added which could be well dispensed with. An examination of the table of contents shows how thoroughly the author has gone over the ground, and the care he has taken in the text to present the subjects in all their bearings, will render this new edition even more necessary to the obstetric student than were either of the former editions at the date of their appearance. No treatise on obstetrics with which we are acquainted can compare favorably with this, in respect to the amount of material which has been gathered from every source.—*Boston Med. and Surg. Journal.*

There is no better text-book for students, or work of reference and study for the practising physician than this. It should adorn and enrich every medical library.—*Chicago Med. Journal.*

## *MONTGOMERY (W. F.), M. D.,*

*Professor of Midwifery in the King's and Queen's College of Physicians in Ireland.*

**AN EXPOSITION OF THE SIGNS AND SYMPTOMS OF PREGNANCY.** With some other Papers on Subjects connected with Midwifery. From the second and enlarged English edition. With two exquisite colored plates, and numerous wood-cuts. In one very handsome octavo volume of nearly 600 pages, extra cloth. $3 75.

**RIGBY'S SYSTEM OF MIDWIFERY.** With Notes and Additional Illustrations. Second American edition. One volume octavo, extra cloth, 422 pages. $2 50.

**DEWEES'S COMPREHENSIVE SYSTEM OF MIDWIFERY.** Twelfth edition, with the author's last improvements and corrections. In one octavo volume, extra cloth, of 600 pages. $3 50.

## *GROSS (SAMUEL D.), M.D.,*

*Professor of Surgery in the Jefferson Medical College of Philadelphia.*

### A SYSTEM OF SURGERY: Pathological, Diagnostic, Therapeutic,

and Operative. Illustrated by upwards of Thirteen Hundred Engravings. Fourth edition, carefully revised, and improved. In two large and beautifully printed royal octavo volumes of 2200 pages, strongly bound in leather, with raised bands. $15 00.

The continued favor, shown by the exhaustion of successive large editions of this great work, proves that it has successfully supplied a want felt by American practitioners and students. Though but little over six years have elapsed since its first publication, it has already reached its fourth edition, while the care of the author in its revision and correction has kept it in a constantly improved shape. By the use of a close, though very legible type, an unusually large amount of matter is condensed in its pages, the two volumes containing as much as four or five ordinary octavos. This, combined with the most careful mechanical execution, and its very durable binding, renders it one of the cheapest works accessible to the profession. Every subject properly belonging to the domain of surgery is treated in detail, so that the student who possesses this work may be said to have in it a surgical library.

It must long remain the most comprehensive work on this important part of medicine.—*Boston Medical and Surgical Journal*, March 23, 1865.

We have compared it with most of our standard works, such as those of Erichsen, Miller, Fergusson, Syme, and others, and we must, in justice to our author, award it the pre-eminence. As a work, complete in almost every detail, no matter how minute or trifling, and embracing every subject known in the principles and practice of surgery, we believe it stands without a rival. Dr Gross, in his preface, remarks "my aim has been to embrace the whole domain of surgery, and to allot to every subject its legitimate claim to notice;" and, we assure our readers, he has kept his word. It is a work which we can most confidently recommend to our brethren, for its utility is becoming the more evident the longer it is upon the shelves of our library.—*Canada Med. Journal*, September, 1865.

The first two editions of Professor Gross' System of Surgery are so well known to the profession, and so highly prized, that it would be idle for us to speak in praise of this work.—*Chicago Medical Journal*, September, 1865.

We gladly indorse the favorable recommendation of the work, both as regards matter and style, which we made when noticing its first appearance.—*British and Foreign Medico-Chirurgical Review*, Oct. 1865.

The most complete work that has yet issued from the press on the science and practice of surgery.—*London Lancet.*

This system of surgery is, we predict, destined to take a commanding position in our surgical literature, and be the crowning glory of the author's well earned fame. As an authority on general surgical subjects, this work is long to occupy a pre-eminent place, not only at home, but abroad. We have no hesitation in pronouncing it without a rival in our language, and equal to the best systems of surgery in any language.—*N. Y. Med. Journal.*

Not only by far the best text-book on the subject, as a whole, within the reach of American students, but one which will be much more than ever likely to be resorted to and regarded as a high authority abroad.—*Am. Journal Med. Sciences*, Jan. 1865.

The work contains everything, minor and major, operative and diagnostic, including mensuration and examination, venereal diseases, and uterine manipulations and operations. It is a complete Thesaurus of modern surgery, where the student and practitioner shall not seek in vain for what they desire.—*San Francisco Med. Press*, Jan. 1865.

Open it where we may, we find sound practical information conveyed in plain language. This book is no mere provincial or even national system of surgery, but a work which, while very largely indebted to the past, has a strong claim on the gratitude of the future of surgical science.—*Edinburgh Med. Journal*, Jan. 1865.

A glance at the work is sufficient to show that the author and publisher have spared no labor in making it the most complete "System of Surgery" ever published in any country.—*St. Louis Med. and Surg. Journal*, April, 1865.

A system of surgery which we think unrivalled in our language, and which will indelibly associate his name with surgical science. And what, in our opinion, enhances the value of the work is that, while the practising surgeon will find all that he requires in it, it is at the same time one of the most valuable treatises which can be put into the hands of the student seeking to know the principles and practice of this branch of the profession which he designs subsequently to follow.—*The Brit. Am. Journ., Montreal.*

*BY THE SAME AUTHOR.*

### A PRACTICAL TREATISE ON FOREIGN BODIES IN THE

AIR-PASSAGES. In 1 vol. 8vo. cloth, with illustrations. pp. 468. $2 75.

SKEY'S OPERATIVE SURGERY. In 1 vol. 8vo. cloth, of over 650 pages; with about 100 wood-cuts. $3 25

COOPER'S LECTURES ON THE PRINCIPLES AND PRACTICE OF SURGERY. In 1 vol. 8vo. cloth, 750 p. $2.

GIBSON'S INSTITUTES AND PRACTICE OF SURGERY. Eighth edition, improved and altered. With thirty-four plates. In two handsome octavo volumes, about 1000 pp., leather, raised bands. $6 50.

## *MILLER (JAMES),*

*Late Professor of Surgery in the University of Edinburgh, &c.*

### PRINCIPLES OF SURGERY. Fourth American, from the third and

revised Edinburgh edition. In one large and very beautiful volume of 700 pages, with two hundred and forty illustrations on wood, extra cloth. $3 75.

*BY THE SAME AUTHOR.*

### THE PRACTICE OF SURGERY. Fourth American, from the last

Edinburgh edition. Revised by the American editor. Illustrated by three hundred and sixty-four engravings on wood. In one large octavo volume of nearly 700 pages, extra cloth. $3 75.

## *SARGENT (F. W.), M.D.*

### ON BANDAGING AND OTHER OPERATIONS OF MINOR SURGERY.

New edition, with an additional chapter on Military Surgery. One handsome royal 12mo. volume, of nearly 400 pages, with 184 wood-cuts. Extra cloth, $1 75.

*ASHHURST (JOHN, Jr.), M.D.,*
***Surgeon to the Episcopal Hospital, Philadelphia.***

**THE PRINCIPLES AND PRACTICE OF SURGERY.** In one very large and handsome octavo volume of about 1000 pages, with nearly 550 illustrations, extra cloth, $6 50; leather, raised bands, $7 50. (*Just Ready.*)

The object of the author has been to present, within as condensed a compass as possible, a complete treatise on Surgery in all its branches, suitable both as a text-book for the student and a work of reference for the practitioner. So much has of late years been done for the advancement of Surgical Art and Science, that there seemed to be a want of a work which should present the latest aspects of every subject, and which, by its American character, should render accessible to the profession at large the experience of the practitioners of both hemispheres. This has been the aim of the author, and it is hoped that the volume will be found to fulfil its purpose satisfactorily. The plan and general outline of the work will be seen by the annexed

**CONDENSED SUMMARY OF CONTENTS.**

CHAPTER I. Inflammation. II. Treatment of Inflammation. III. Operations in general: Anæsthetics. IV. Minor Surgery. V. Amputations. VI. Special Amputations. VII. Effects of Injuries in General: Wounds. VIII. Gunshot Wounds. IX. Injuries of Bloodvessels. X. Injuries of Nerves, Muscles and Tendons, Lymphatics, Bursæ, Bones, and Joints. XI. Fractures. XII. Special Fractures. XIII. Dislocations. XIV. Effects of Heat and Cold. XV. Injuries of the Head. XVI. Injuries of the Back. XVII. Injuries of the Face and Neck. XVIII. Injuries of the Chest. XIX. Injuries of the Abdomen and Pelvis. XX. Diseases resulting from Inflammation. XXI. Erysipelas. XXII. Pyæmia. XXIII. Diathetic Diseases: Struma (including Tubercle and Scrofula); Rickets. XXIV. Venereal Diseases; Gonorrhœa and Chancroid. XXV. Venereal Diseases continued: Syphilis. XXVI. Tumors. XXVII. Surgical Diseases of Skin, Areolar Tissue, Lymphatics, Muscles, Tendons, and Bursæ. XXVIII. Surgical Disease of Nervous System (including Tetanus). XXIX. Surgical Diseases of Vascular System (including Aneurism). XXX. Diseases of Bone. XXXI. Diseases of Joints. XXXII. Excisions. XXXIII. Orthopædic Surgery. XXXIV. Diseases of Head and Spine. XXXV. Diseases of the Eye. XXXVI. Diseases of the Ear. XXXVII. Diseases of the Face and Neck. XXXVIII. Diseases of the Mouth, Jaws, and Throat. XXXIX. Diseases of the Breast. XL. Hernia. XLI. Special Herniæ. XLII. Diseases of Intestinal Canal. XLIII. Diseases of Abdominal Organs, and various operations on the Abdomen. XLIV. Urinary Calculus. LXV. Diseases of Bladder and Prostate. XLVI. Diseases of Urethra. XLVII. Diseases of Generative Organs. INDEX.

---

*ERICHSEN (JOHN),*
***Senior Surgeon to University College Hospital.***

**THE SCIENCE AND ART OF SURGERY;** being a Treatise on Surgical Injuries, Diseases, and Operations. From the Fifth enlarged and carefully revised London Edition. With Additions by JOHN ASHHURST, Jr., M. D., Surgeon to the Episcopal Hospital, &c. Illustrated by over six hundred Engravings on wood. In one very large and beautifully printed imperial octavo volume, containing over twelve hundred closely printed pages: cloth, $7 50; leather, raised bands, $8 50. (*Lately Published.*)

Erichsen's Surgery needs no review at the present day. Long ago it took and has since maintained a leading position in surgical literature, and this position is so firmly held, that no efforts on the part of a reviewer would serve to weaken the estimate which has been placed upon the book—nor, indeed, could they materially strengthen it. The duty, then, devolving upon us is simply to note the appearance of this new edition, and to point out the improvements therein made.—*N. Y. Med. Journal*, Jan. 1870.

In the recent republication in this country of the last London edition of "Erichsen's Surgery" the practitioner and student are supplied with a guide and text-book which apparently leaves nothing to be desired. Full and complete in every essential particular, and inculcating the most advanced and correct modes of practice, it is certain to come into very general use. The additions of Dr Ashhurst, though not extensive, are to the point; they relate chiefly to items of American practice.—*The Journal of Psychological Medicine*, Jan. 1870.

Whether we regard it as a text-book for the medical student, or as a guide for the practitioner, it deserves our highest praise.—*Am. Journ. Med Sci.*, Jan. 1870.

A noble volume, to review which would require an analysis of the whole domain of modern surgery. Within its comprehensive compass will be found every detail of information which is needed by the practical surgeon.—*N. Y. Med. Gazette*, Oct. 23, 1869.

If there are two books which are more familiar and more generally known to the medical student, they are those of Watson's Practice and Erichsen's Surgery. And few will deny that their distinguished authors are deserving of this and all honor which has been paid them. Watson's Practice but a few years since might have been called the Bible of Physicians, and Erichsen's volume now before us is not undeserving of a similar compliment from the surgeon. The original English edition is too well known to need any recommendation on our part, but this American edition has so much in it that has been added by the American editor, Dr. Ashhurst, as to call forth the highest praise and most sincere admiration of the completeness with which he has done his part in rendering the book the best on general surgery which is offered to the surgeon in this country.—*The Am. Journ. of Obstetrics*, Nov. 1869.

*BY THE SAME AUTHOR.* (*Just Issued.*)

**ON RAILWAY, AND OTHER INJURIES OF THE NERVOUS SYSTEM.** In small octavo volume. Extra cloth, $1 00.

---

*PIRRIE (WILLIAM), F. R. S. E.,*
***Professor of Surgery in the University of Aberdeen.***

**THE PRINCIPLES AND PRACTICE OF SURGERY.** Edited by JOHN NEILL, M. D., Professor of Surgery in the Penna. Medical College, Surgeon to the Pennsylvania Hospital, &c. In one very handsome octavo volume of 780 pages, with 316 *illustrations*, extra cloth. $3 75.

*DRUITT (ROBERT), M.R.C.S., &c.*

### THE PRINCIPLES AND PRACTICE OF MODERN SURGERY.

A new and revised American, from the eighth enlarged and improved London edition. Illustrated with four hundred and thirty-two wood-engravings. In one very handsome octavo volume, of nearly 700 large and closely printed pages. Extra cloth, $4 00; leather, $5 00.

All that the surgical student or practitioner could desire.—*Dublin Quarterly Journal.*

It is a most admirable book. We do not know when we have examined one with more pleasure.—*Boston Med. and Surg. Journal.*

In Mr. Druitt's book, though containing only some seven hundred pages, both the principles and the practice of surgery are treated, and so clearly and perspicuously, as to elucidate every important topic. The fact that twelve editions have already been called for, in these days of active competition, would of itself show it to possess marked superiority. We have examined the book most thoroughly, and can say that this success is well merited. His book, moreover, possesses the inestimable advantages of having the subjects perfectly well arranged and classified, and of being written in a style at once clear and succinct.—*Am. Journal of Med. Sciences.*

Whether we view Druitt's Surgery as a guide to operative procedures, or as representing the latest theoretical surgical opinions, no work that we are at present acquainted with can at all compare with it. It is a compendium of surgical theory (if we may use the word) and practice in itself, and well deserves the estimate placed upon it.—*Brit. Am. Journal.*

Thus enlarged and improved, it will continue to rank among our best text-books on elementary surgery.—*Columbus Rev. of Med. and Surg.*

We must close this brief notice of an admirable work by recommending it to the earnest attention of every medical student.—*Charleston Medical Journal and Review.*

A text-book which the general voice of the profession in both England and America has commended as one of the most admirable "manuals," or, "*vade mecum*," as its English title runs, which can be placed in the hands of the student. The merits of Druitt's Surgery are too well known to every one to need any further eulogium from us.—*Nashville Med. Journal.*

---

*HAMILTON (FRANK H.), M.D.,*

*Professor of Fractures and Dislocations, &c., in Bellevue Hosp. Med. College, New York.*

### A PRACTICAL TREATISE ON FRACTURES AND DISLOCATIONS.

Fourth edition, thoroughly revised. In one large and handsome octavo volume of nearly 800 pages, with several hundred illustrations. Extra cloth, $5 75; leather, $6 75. (*Just Ready.*)

In revising this standard work, the author has omitted much which the progress of science has seemed to render less important, and has thus gained room for a large amount of new matter, so that with but little increase in the size of the volume he has yet been able to present the subject in its most recent aspect. The series of illustrations has likewise undergone a thorough revision; nearly one-fourth of the wood-cuts in the last edition have been rejected, and their places supplied, for the most part, with original drawings, representing the most approved forms of apparel, and the latest views with regard to the pathology of fractures and dislocations. In its present improved form, therefore, it is hoped that the volume may maintain the character which it has acquired of a standard authority on every detail of its important subject.

It is not, of course, our intention to review *in extenso*, Hamilton on "Fractures and Dislocations." Eleven years ago such review might not have been out of place; to-day the work is an authority, so well, so generally, and so favorably known, that it only remains for the reviewer to say that a new edition is just out, and it is better than either of its predecessors.—*Cincinnati Clinic*, Oct. 14, 1871.

Undoubtedly the best work on Fractures and Dislocations in the English language.—*Cincinnati Med. Repertory*, Oct. 1871.

We have once more before us Dr. Hamilton's admirable treatise, which we have always considered the most complete and reliable work on the subject. As a whole, the work is without an equal in the literature of the profession.—*Boston Med. and Surg. Journ.*, Oct. 12, 1871.

It is unnecessary at this time to commend the book, except to such as are beginners in the study of this particular branch of surgery. Every practical surgeon in this country and abroad knows of it as a most trustworthy guide, and one which they, in common with us, would unqualifiedly recommend as the highest authority in any language.—*N. Y. Med. Record*, Oct 16, 1871.

---

*ASHTON (T. J.).*

### ON THE DISEASES, INJURIES, AND MALFORMATIONS OF THE RECTUM AND ANUS;

with remarks on Habitual Constipation. Second American, from the fourth and enlarged London edition. With handsome illustrations. In one very beautifully printed octavo volume of about 300 pages. $3 25.

We can recommend this volume of Mr Ashton's in the strongest terms, as containing all the latest details of the pathology and treatment of diseases connected with the rectum.—*Canada Med. Journ.*, March, 1866.

One of the most valuable special treatises that the physician and surgeon can have in his library.—*Chicago Medical Examiner*, Jan. 1866.

The short period which has elapsed since the appearance of the former American reprint, and the numerous editions published in England, are the best arguments we can offer of the merits, and of the uselessness of any commendation on our part of a book already so favorably known to our readers.—*Boston Med. and Surg. Journal*, Jan. 25, 1866.

---

*BIGELOW (HENRY J.), M. D.,*

*Professor of Surgery in the Massachusetts Med. College.*

### ON THE MECHANISM OF DISLOCATION AND FRACTURE OF THE HIP.

With the Reduction of the Dislocation by the Flexion Method. With numerous original illustrations. In one very handsome octavo volume. Cloth. $2 50. (*Lately Issued.*)

We cannot too highly praise this book as the work of an accomplished and scientific surgeon. We do not hesitate to say that he has done much to clear up the obscurities connected with the mechanism of dislocation of the hip-joint, and he has laid down most valuable practical rules for the easy and most successful management of these injuries. The monograph is largely illustrated with exquisitely executed woodcuts, after photographs, which help to elucidate the admirable subject-matter of the text. We cordially commend the "Hip," by Dr. Bigelow, to the attention of surgeons.—*Dublin Quarterly Journal of Medical Science*, Feb. 1870.

## *WELLS (J. SOELBERG),*

*Professor of Ophthalmology in King's College Hospital, &c.*

**A TREATISE ON DISEASES OF THE EYE.** First American Edition, with additions; illustrated with 216 engravings on wood, and six colored plates. Together with selections from the Test-types of Jaeger and Snellen. In one large and very handsome octavo volume of about 750 pages: extra cloth, $5 00; leather, $6 00. (*Lately Issued.*)

A work has long been wanting which should represent adequately and completely the present aspect of British Ophthalmology, and this want it has been the aim of Mr. Wells to supply. The favorable reception of his volume by the medical press is a guarantee that he has succeeded in his undertaking, and in reproducing the work in this country every effort has been made to render it in every way suited to the wants of the American practitioner. Such additions as seemed desirable have been introduced by the editor, Dr. I. Minis Hays, and the number of illustrations has been more than doubled. The importance of test-types as an aid to diagnosis is so universally acknowledged at the present day that it seemed essential to the completeness of the work that they should be added, and as the author recommends the use of those both of Jaeger and of Snellen for different purposes, selections have been made from each, so that the practitioner may have at command all the assistance necessary. The work is thus presented as in every way fitted to merit the confidence of the American profession.

In this respect the work before us is of much more service to the general practitioner than those heavy compilations which, in giving every person's views, too often neglect to specify those which are most in accordance with the author's opinions, or in general acceptance. We have no hesitation in recommending this treatise, as, on the whole, of all English works on the subject, the one best adapted to the wants of the general practitioner.—*Edinburgh Med. Journal*, March, 1870.

A treatise of rare merit. It is practical, comprehensive, and yet concise. Upon those subjects usually found difficult to the student, he has dwelt at length and entered into full explanation. After a careful perusal of its contents, we can unhesitatingly commend it to all who desire to consult a really good work on ophthalmic science. The American edition of Mr. Wells' treatise was superintended in its passage through the press by Dr. I. Minis Hays, who has added some notes of his own where it seemed desirable. He has also introduced more than one hundred new additional wood-cuts, and added selections from the test-types of Jaeger and of Snellen.—*Leavenworth Med. Herald*, Jan. 1870.

Without doubt, one of the best works upon the subject which has ever been published; it is complete on the subject of which it treats, and is a necessary work for every physician who attempts to treat diseases of the eye.—*Dominion Med. Journal*, Sept. 1869.

## *TOYNBEE (JOSEPH), F. R. S.,*

*Aural Surgeon to and Lecturer on Surgery at St. Mary's Hospital.*

**THE DISEASES OF THE EAR: their Nature, Diagnosis, and Treatment.** With one hundred engravings on wood. Second American edition. In one very handsomely printed octavo volume of 440 pages; extra cloth, $4.

## *LAURENCE (JOHN Z.), F. R. C. S.,*

*Editor of the Ophthalmic Review, &c.*

**A HANDY-BOOK OF OPHTHALMIC SURGERY, for the use of** Practitioners. Second Edition, revised and enlarged. With numerous illustrations. In one very handsome octavo volume, extra cloth, $3 00. (*Lately Issued.*)

This is, as its name suggests, a book for convenient reference rather than an exhaustive treatise, and as such it will be found very valuable to the general physician. It gives in very brief terms the symptoms and history of the various diseases of the eye, with just enough cases detailed to elucidate the text without confusing the reader. His chapter on examination of the eye is particularly good, and, it seems to us, better calculated to enlighten a novice than any similar instructions we have read.—*California Med. Gazette*, Jan. 1870.

For those, however, who must assume the care of diseases and injuries of the eye, and who are too much pressed for time to study the classic works on the subject, or those recently published by Stellwag, Wells, Bader, and others, Mr. Laurence will prove a safe and trustworthy guide. He has described in this edition those novelties which have secured the confidence of the profession since the appearance of his last. To the portion of the book devoted to a description of the optical defects of the eye, the publisher has given increased value by the addition of several pages of Snellen's test-types, so generally used to test the acuteness of vision, and which are difficult to obtain in this country The volume has been considerably enlarged and improved by the revision and additions of its author, expressly for the American edition —*Am. Journ. Med Sciences*, Jan. 1870.

## *LAWSON (GEORGE), F. R. C. S., Engl.,*

*Assistant Surgeon to the Royal London Ophthalmic Hospital, Moorfields, &c.*

**INJURIES OF THE EYE, ORBIT, AND EYELIDS: their Immediate and Remote Effects.** With about one hundred illustrations. In one very handsome octavo volume, extra cloth, $3 50

It is an admirable practical book in the highest and best sense of the phrase.—*London Medical Times and Gazette*, May 18, 1867.

## *MORLAND (W. W.), M.D.*

**DISEASES OF THE URINARY ORGANS; a Compendium of their** Diagnosis, Pathology, and Treatment. With illustrations In one large and handsome octavo volume of about 600 pages, extra cloth. $3 50.

## *BRYANT (THOMAS), F.R.C.S.*

**THE PRACTICE OF SURGERY.** A Manual, with numerous engravings on wood. In one very handsome volume. (Preparing.)

## *WALES (PHILIP S.), M. D., Surgeon U. S. N.*

### MECHANICAL THERAPEUTICS: a Practical Treatise on Surgical

**Apparatus, Appliances, and Elementary Operations: embracing Minor Surgery, Bandaging, Orthopraxy, and the Treatment of Fractures and Dislocations. With six hundred and forty-two illustrations on wood. In one large and handsome octavo volume of about 700 pages: extra cloth, $5 75; leather, $6 75.**

**A Naval Medical Board directed to examine and report upon the merits of this volume, officially states that "it should in our opinion become a standard work in the hands of every naval surgeon;" and its adoption for use in both the Army and Navy of the United States is sufficient guarantee of its adaptation to the needs of every-day practice.**

It is a unique specimen of literature in its way, in that, treating upon such a variety of subjects, it is as a whole so completely up to the wants of the student and the general practitioner. We have never seen any work of its kind that can compete with it in real utility and extensive adaptability. In conclusion, we would state, at the risk of reiteration, that this is the most comprehensive book on the subject that we have seen; is the best that can be placed in the hands of the student in need of a first book on surgery, and the most useful that can be named for such general practitioners who, without any special pretensions to surgery, are occasionally liable to treat surgical cases.—*N. Y. Med. Record*, March 2, 1868.

It is certainly the most complete and thorough work of its kind in the English language. Students and young practitioners of surgery will find it invaluable. It will prove especially useful to inexperienced country practitioners, who are continually required to take charge of surgical cases, under circumstances precluding them from the aid of experienced surgeons.—*Pacific Med. and Surg. Journal*, Feb. 1868.

The title of the above work is sufficiently indicative of its contents. We have not seen for a long time (in the English language) a treatise equal to this in extent, nor one which is better adapted to the wants of the general student and practitioner. It is not to the surgeon alone that this book belongs; the physician has frequent opportunities to fill an emergency by such knowledge as is here given. Every practitioner should make purchase of such a book—it will last him his lifetime.——*St. Louis Med. Reporter*, Feb. 1868.

## *THOMPSON (SIR HENRY).*

*Surgeon and Professor of Clinical Surgery to University College Hospital.*

### LECTURES ON DISEASES OF THE URINARY ORGANS. With

**illustrations on wood. In one neat octavo volume, extra cloth. $2 25.**

These lectures stand the severe test. They are instructive without being tedious, and simple without being diffuse; and they include many of those practical hints so useful for the student, and even more valuable to the young practitioner.—*Edinburgh Med. Journal*, April, 1869.

Very few words of ours are necessary to recommend these lectures to the profession. There is no subject on which Sir Henry Thompson speaks with more authority than that in which he has specially gathered his laurels; in addition to this, the conversational style of instruction, which is retained in these printed lectures, gives them an attractiveness which a systematic treatise can never possess.—*London Medical Times and Gazette*, April 24, 1869.

## *BY THE SAME AUTHOR.*

### ON THE PATHOLOGY AND TREATMENT OF STRICTURE OF

**THE URETHRA AND URINARY FISTULÆ. With plates and wood-cuts. From the third and revised English edition. In one very handsome octavo volume, extra cloth, $3 50. (*Just Issued.*)**

**This classical work has so long been recognized as a standard authority on its perplexing subjects that it should be rendered accessible to the American profession. Having enjoyed the advantage of a revision at the hands of the author within a few months, it will be found to present his latest views and to be on a level with the most recent advances of surgical science.**

With a work accepted as *the* authority upon the subjects of which it treats, an extended notice would be a work of supererogation. The simple announcement of another edition of a work so well and favorably known by the profession as this before us, must create a demand for it from those who would keep themselves well up in this department of surgery.—*St. Louis Med. Archives*, Feb. 1870.

## *TAYLOR (ALFRED S.), M.D.,*

*Lecturer on Med. Jurisp. and Chemistry in Guy's Hospital.*

### MEDICAL JURISPRUDENCE. Sixth American, from the eighth

**and revised London edition. With Notes and References to American Decisions, by CLEMENT B. PENROSE, of the Philadelphia Bar. In one large octavo volume of 776 pages, extra cloth, $4 50; leather, $5 50.**

The sixth edition of this popular work comes to us in charge of a new editor, Mr. Penrose, of the Philadelphia bar, who has done much to render it useful, not only to the medical practitioners of this country, but to those of his own profession. Wisely retaining the references of the former American editor, Dr. Hartshorne, he has added many valuable notes of his own. The reputation of Dr. Taylor's work is so well established, that it needs no recommendation. He is now the highest living authority on all matters connected with forensic medicine, and every successive edition of his valuable work gives fresh assurance to his many admirers that he will continue to maintain his well-earned position. No one should, in fact, be without a text-book on the subject, as he does not know but that his next case may create for him an emergency for its use. To those who are not the fortunate possessors of a reliable, readable, interesting, and thoroughly practical work upon the subject, we would earnestly recommend this, as forming the best groundwork for all their future studies of the more elaborate treatises.—*New York Medical Record*, Feb. 15, 1867.

The present edition of this valuable manual is a great improvement on those which have preceded it. It makes thus by far the best guide-book in this department of medicine for students and the general practitioner in our language.—*Boston Med. and Surg. Journal*, Dec. 27, 1866.

## *BLANDFORD (G. FIELDING), M. D., F. R. C P.,*

*Lecturer on Psychological Medicine at the School of St. George's Hospital, &c.*

### INSANITY AND ITS TREATMENT: Lectures on the Treatment,

Medical and Legal, of Insane Patients. With a Summary of the Laws in force in the United States on the Confinement of the Insane. By ISAAC RAY, M. D. In one very handsome octavo volume of 471 pages: extra cloth, $3 25. (*Just Issued.*)

This volume is presented to meet the want, so frequently expressed, of a comprehensive treatise, in moderate compass, on the pathology, diagnosis, and treatment of insanity. To render it of more value to the practitioner in this country, Dr. Ray has added an appendix which affords information, not elsewhere to be found in so accessible a form, to physicians who may at any moment be called upon to take action in relation to patients.

It satisfies a want which must have been sorely felt by the busy general practitioners of this country. It takes the form of a manual of clinical description of the various forms of insanity, with a description of the mode of examining persons suspected of insanity. We call particular attention to this feature of the book, as giving it a unique value to the general practitioner. If we pass from theoretical considerations to descriptions of the varieties of insanity as actually seen in practice and the appropriate treatment for them, we find in Dr. Blandford's work a considerable advance over previous writings on the subject. His pictures of the various forms of mental disease are so clear and good that no reader can fail to be struck with their superiority to those given in ordinary manuals in the English language or (so far as our own reading extends) in any other.—*London Practitioner*, Feb. 1871.

Dr. Blandford's book well meets the prevailing deficiency, and is one of that class, unhappily too small, which prove a real blessing to the busy practitioner who has no other time for reading but those odd moments which he can catch in his brief intervals of leisure. It is so free from defects and is so fair a representation of the most approved views respecting insanity, that we find in it small occasion for criticism, and can do little more than commend it as an admirable manual for practical use. We end as we began, in heartily recommending it as a most useful and reliable guide to the general practitioner.—*Am. Journal Med. Sciences*, April, 1871.

## *WINSLOW (FORBES), M.D., D.C.L., &c.*

### ON OBSCURE DISEASES OF THE BRAIN AND DISORDERS

OF THE MIND; their incipient Symptoms, Pathology, Diagnosis, Treatment, and Prophylaxis. Second American, from the third and revised English edition. In one handsome octavo volume of nearly 600 pages, extra cloth. $4 25. (*Lately Issued.*)

A work which, like the present, will largely aid the practitioner in recognizing and arresting the first insidious advances of cerebral and mental disease, is one of immense practical value, and demands earnest attention and diligent study on the part of all who have embraced the medical profession, and have thereby undertaken responsibilities in which the welfare and happiness of individuals and families are largely involved. We shall therefore close this brief and necessarily very imperfect notice of Dr. Winslow's great and classical work by expressing our conviction that it is long since so important and beautifully written a volume has issued from the British medical press.—*Dublin Medical Press.*

It is the most interesting as well as valuable book that we have seen for a long time. It is truly fascinating.—*Am. Jour. Med. Sciences.*

## *LEA (HENRY C.).*

### SUPERSTITION AND FORCE: ESSAYS ON THE WAGER OF

LAW, THE WAGER OF BATTLE, THE ORDEAL, AND TORTURE. Second Edition, Enlarged. In one handsome volume royal 12mo. of nearly 500 pages; extra cloth, $2 75. (*Just Issued.*)

We know of no single work which contains, in so small a compass, so much illustrative of the strangest operations of the human mind. Foot-notes give the authority for each statement, showing vast research and wonderful industry. We advise our *confrères* to read this book and ponder its teachings.—*Chicago Med. Journal*, Aug. 1870.

As a work of curious inquiry on certain outlying points of obsolete law, "Superstition and Force" is one of the most remarkable books we have met with. —*London Athenæum*, Nov. 3, 1866.

He has thrown a great deal of light upon what must be regarded as one of the most instructive as well as interesting phases of human society and progress. . . The fulness and breadth with which he has carried out his comparative survey of this repulsive field of history [Torture], are such as to preclude our doing justice to the work within our present limits. But here, as throughout the volume, there will be found a wealth of illustration and a critical grasp of the philosophical import of facts which will render Mr. Lea's labors of sterling value to the historical student.—*London Saturday Review*, Oct. 8, 1870.

As a book of ready reference on the subject, it is of the highest value.—*Westminster Review*, Oct. 1867.

## *BY THE SAME AUTHOR.* (*Just Issued.*)

### STUDIES IN CHURCH HISTORY—THE RISE OF THE TEMPORAL POWER—BENEFIT OF CLERGY—EXCOMMUNICATION.

In one large royal 12mo. volume of 516 pp. extra cloth. $2 75.

The story was never told more calmly or with greater learning or wiser thought. We doubt, indeed, if any other study of this field can be compared with this for clearness, accuracy, and power.—*Chicago Examiner*, Dec. 1870.

Mr. Lea's latest work, "Studies in Church History," fully sustains the promise of the first. It deals with three subjects—the Temporal Power, Benefit of Clergy, and Excommunication, the record of which has a peculiar importance for the English student, and is a chapter on Ancient Law likely to be regarded as final. We can hardly pass from our mention of such works as these—with which that on "Sacerdotal Celibacy" should be included—without noting the literary phenomenon that the head of one of the first American houses is also the writer of some of its most original books.—*London Athenæum*, Jan. 7, 1871.

Mr. Lea has done great honor to himself and this country by the admirable works he has written on ecclesiological and cognate subjects. We have already had occasion to commend his "Superstition and Force" and his "History of Sacerdotal Celibacy." The present volume is fully as admirable in its method of dealing with topics and in the thoroughness—a quality so frequently lacking in American authors—with which they are investigated.—N. Y. Journal of *Psychol. Medicine*, July, 1870.

# INDEX TO CATALOGUE.

PAGE
American Journal of the Medical Sciences . 1
Abstract, Half-Yearly, of the Med Sciences . 3
Anatomical Atlas, by Smith and Horner . 6
Ashton on the Rectum and Anus . 28
Attfield's Chemistry . 10
Ashwell on Diseases of Females . 22
Ashhurst's Surgery . 27
Barnes on Diseases of Women . 22
Bryant's Practical Surgery . 29
Blandford on Insanity . 31
Basham on Renal Diseases . 18
Brinton on the Stomach . 15
Bigelow on the Hip . 28
Barclay's Medical Diagnosis . 14
Barlow's Practice of Medicine . 15
Bowman's (John E.) Practical Chemistry . 10
Bowman's (John E.) Medical Chemistry . 10
Brande & Taylor's Chemistry . 11
Buckler on Bronchitis . 17
Bucknill and Tuke on Insanity . 14
Bumstead on Venereal . 19
Bumstead and Cullerier's Atlas of Venereal . 19
Carpenter's Human Physiology . 8
Carpenter's Comparative Physiology . 8
Carpenter on the Use and Abuse of Alcohol . 13
Carson's Synopsis of Materia Medica . 13
Chambers on the Indigestions . 16
Chambers's Restorative Medicine . 16
Christison and Griffith's Dispensatory . 13
Churchill's System of Midwifery . 25
Churchill on Puerperal Fever . 22
Condie on Diseases of Children . 21
Cooper's (B. B) Lectures on Surgery . 28
Cullerier's Atlas of Venereal Diseases . 19
Cyclopedia of Practical Medicine . 14
Dalton's Human Physiology . 9
De Jongh on Cod-Liver Oil . 13
Dewees's System of Midwifery . 25
Dewees on Diseases of Females . 22
Dewees on Diseases of Children . 21
Druitt's Modern Surgery . 28
Dunglison's Medical Dictionary . 4
Dunglison's Human Physiology . 9
Dunglison on New Remedies . 13
Ellis's Medical Formulary, by Smith . 13
Erichsen's System of Surgery . 27
Erichsen on Nervous Injuries . 27
Flint on Respiratory Organs . 17
Flint on the Heart . 17
Flint's Practice of Medicine . 15
Fownes's Elementary Chemistry . 11
Fuller on the Lungs, &c. . 16
Green's Pathology and Morbid Anatomy . 14
Gibson's Surgery . 26
Gluge's Pathological Histology, by Leidy . 14
Graham's Elements of Chemistry . 10
Gray's Anatomy . 6
Griffith's (R. E.) Universal Formulary . 12
Gross on Foreign Bodies in Air-Passages . 26
Gross's Principles and Practice of Surgery . 26
Gross's Pathological Anatomy . 14
Guersant on Surgical Diseases of Children . 21
Hartshorne's Essentials of Medicine . 16
Hartshorne's Conspectus of the Medical Sciences 5
Hamilton on Dislocations and Fractures . 28
Heath's Practical Anatomy . 7
Hoblyn's Medical Dictionary . 4
Hodge on Women . 23
Hodge's Obstetrics . 24
Hodges' Practical Dissections . 6
Holland's Medical Notes and Reflections . 14
Horner's Anatomy and Histology . 7
Hudson on Fevers, . 18
Hill on Venereal Diseases . 19
Hillier's Handbook of Skin Diseases . 20
Jones and Sieveking's Pathological Anatomy . 14
Jones (C. Handfield) on Nervous Disorders . 18
Kirkes' Physiology . 8
Knapp's Chemical Technology . 10
Lea's Superstition and Force . 31

PAGE
Lea's Studies in Church History . 31
Lallemand and Wilson on Spermatorrhœa . 19
La Roche on Yellow Fever . 14
La Roche on Pneumonia, &c. . 17
Laurence and Moon's Ophthalmic Surgery . 29
Lawson on the Eye . 29
Laycock on Medical Observation . 14
Lehmann's Physiological Chemistry, 2 vols. . 9
Lehmann's Chemical Physiology . 9
Ludlow's Manual of Examinations . 6
Lyons on Fever . 18
Maclise's Surgical Anatomy . 7
Marshall's Physiology . 8
Medical News and Library . 2
Meigs's Obstetrics, the Science and the Art . 25
Meigs's Lectures on Diseases of Women . 23
Meigs on Puerperal Fever . 23
Miller's Practice of Surgery . 26
Miller's Principles of Surgery . 26
Montgomery on Pregnancy . 25
Morland on Urinary Organs . 29
Morland on Uræmia . 18
Neill and Smith's Compendium of Med. Science . 5
Neligan's Atlas of Diseases of the Skin . 20
Neligan on Diseases of the Skin . 20
Odling's Practical Chemistry . 10
Pavy on Digestion . 15
Prize Essays on Consumption . 17
Parrish's Practical Pharmacy . 12
Pirrie's System of Surgery . 27
Pereira's Mat. Medica and Therapeutics, abridged 13
Quain and Sharpey's Anatomy, by Leidy . 6
Ranking's Abstract . 3
Radcliff and others on the Nerves, &c. . 18
Roberts on Urinary Diseases . 18
Ramsbotham on Parturition . 25
Rigby on Female Diseases . 22
Rigby's Midwifery . 25
Rokitansky's Pathological Anatomy . 14
Royle's Materia Medica and Therapeutics . 13
Salter on Asthma . 17
Swayne's Obstetric Aphorisms . 24
Sargent's Minor Surgery . 26
Sharpey and Quain's Anatomy, by Leidy . 6
Simon's General Pathology . 14
Simpson on Females . 23
Skey's Operative Surgery . 28
Slade on Diphtheria . 18
Smith (J. L.) on Children . 21
Smith (H. H.) and Horner's Anatomical Atlas . 6
Smith (Edward) on Consumption . 17
Smith on Wasting Diseases of Children . 21
Solly on Anatomy and Diseases of the Brain . 14
Stillé's Therapeutics . 12
Tanner's Manual of Clinical Medicine . 5
Tanner on Pregnancy . 24
Taylor's Medical Jurisprudence . 30
Thomas on Diseases of Females . 22
Thompson on Urinary Organs . 30
Thompson on Stricture . 30
Todd and Bowman's Physiological Anatomy . 9
Todd on Acute Diseases . 15
Toynbee on the Ear . 29
Wales on Surgical Operations . 30
Walshe on the Heart . 17
Watson's Practice of Physic . 16
Wells on the Eye . 29
West on Diseases of Females . 23
West on Diseases of Children . 31
West on Nervous Disorders of Children . 21
West on Ulceration of Os Uteri . 23
What to Observe in Medical Cases . 14
Williams's Principles of Medicine . 14
Williams on Consumption . 17
Wilson's Human Anatomy . 7
Wilson on Diseases of the Skin . 20
Wilson's Plates on Diseases of the Skin . 20
Wilson's Handbook of Cutaneous Medicine . 20
Wilson on Spermatorrhœa . 19
Winslow on Brain and Mind . 31